Effective research and innovation (R&I) policy in the EU-28: A causal and configurational analysis of political governance determinants

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Effective research and innovation (R&I) policy in the EU-28: A causal and configurational analysis of political governance determinants

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Abstract (150 words)

Effective research and innovation (R&I) policy depends on the extent to which ideas, interests and institutional mechanisms for policy making work together rather than work against each other. In a political governance model for effective R&I policy in the EU-28, the separate influence of inter-ministerial coordination, regulatory impact assessment extended to sustainability checks, parliamentary committee surveillance, media attention and societal consultation is investigated. Interaction effects are investigated in a set-theoretic analysis for the econometrically best-fit model. Our results show that the societal consultation, policy-informed opposition and sector-informed informal policy coordination are necessary but not sufficient to bring about effectiveness to R&I policy. Their influence on effectiveness of R&I policy depends on the combination with either media attention or regulatory impact assessment (RIA) extended to sustainability checks. We reached these results with the help of ordered logit estimations and fuzzy-set qualitative comparative analyses using 2011-2013 (SGI) data of Bertelsmann Stiftung and Lexis Nexis Academic.

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Keywords: Proximate political governance, Research and innovation policy, EU-28, Ordered logit estimation, Fuzzy-set qualitative comparative analysis

1. Introduction

For stimulating competitiveness the European Commission has introduced an 80 billion euro research and innovation (R&I) programme called Horizon 2020. The hope is that the programme, which will run from 2014 to 2020, will stimulate the competitiveness of European firms and generate new jobs, being two key political goals in the European Union (EU). This programme shows the high policy salience of R&I in Europe and the programme complements national and regional policies for R&I.

In this article, we study the political governance dimension of effective R&I policy with the help of ordered logit estimations and fuzzy-set qualitative comparative analyses (fs/QCA) of 28 Member States (MS) in the EU, using the data provided by Bertelsmann Stiftung in 2014 for the 2011-2013 period. The data[1] are based on experts' scores for R&I policy effectiveness and five influence variables. The data for media coverage of R&I policy are gathered from Lexis Nexis Academic[2] for the same period of assessment. With the help of ordered logit regressions and set-theoretic analyses, we make a conceptual and an empirical contribution to the study of political governance for the case of effective R&I policy in the EU-28[3].

[1] Bertelsmann Stiftung, Sustainability Governance Indicators, http://www.sgi-network.org/2014/
[2] Lexis Nexis Academic, http://academic.lexisnexis.eu/
[3] Supplementary analyses are also performed with (distal) variables provided by Democracy Barometer, http://www.democracybarometer.org/ and World Governance Indicators (WGI) of the World Bank http://data.worldbank.org/data-catalog/worldwide-governance-indicators

Theoretically, our model is informed by the "policy work" perspective of Colebatch et al. (2010) which views policy workers as essential agents of policy choices, and a Foucauldian perspective of power which views power and knowledge as mutually-constitutive (Foucault, 1980; 1982). Conceptually, our contribution consists of a framework of "proximate political governance factors of R&I policy". It is called a proximate[4] framework because four of our five variables are proximate variables, and the fifth is an intermediate, boundary/proximate variable from the perspective of governmental action. Empirically, we investigate the influence of the following five proximate factors of political governance: inter-ministerial policy coordination, resources of parliamentary committees, regulatory impact assessment extended to sustainability checks, media coverage of R&I policy-related news items, and the influence of societal consultation, as an intermediate, boundary/proximate variable. In doing so, we make a contribution to the study of actor-based political governance of R&I policy in attesting a crucial role to the activities of journalists, members of parliamentary committees, middle-level executives, governmental high-level expert groups, consultation with societal actors, and societal actors about R&I policy choices.

The paper proceeds as follows: Section 2 discusses the literature on political governance of effective R&I policy, accompanied with our conceptual construction: a system of "proximate political governance factors of R&I policy". In Section 3, we describe the data and hypotheses that are tested by ordered logit regressions and fs/QCA analyses. Section 4 offers a discussion of the results for this socio-politically communicative and socio-technically coordinative core architecture behind the paper: the model of proximate political governance of R&I policy framework. Section 5 offers concluding remarks and an outlook on further research.

2. The political governance literature on R&I policy

The literature on R&I policy is dominated by economists, investigating the effects of policy instruments on firm/industry-level innovation activities (Mohnen and Röller, 2005) rather than the politics of policy choices. Economists have also examined the theoretical rationale for innovation policy and conditions for it. The conditions for innovation policy - identified by Edquist (2001) – are that there must be "*a problem that is not automatically solved by market forces and capitalist actors"* and *"the state (national, regional, local) and its public agencies must also have the ability to solve or mitigate the problem"* (Edquist, 2001). For policy agencies to be successful they must possess intelligence about the barriers to innovation which are likely to differ across targeted areas: *"To be effective and not wasteful, innovation policy should be based on identified barriers to particular types*

[4] A proximate cause is an event which is *closest* to, or immediately responsible for causing, some observed result. This exists in contrast to a higher-level ultimate cause (or *distal cause*) which is usually thought of as background reasons for the occurrence of the phenomenon of investigation. The influence of distal variables such as rule of law, regulatory quality, the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media as general background variables is investigated in an indirect way by examining the correlations of such variables with the five proximate political governance variables included in our conceptual model.

of (...) innovation instead of on abstract notions of market failure and system failure… this requires mechanisms for learning about those barriers" (Kemp, 2011, p. 9).

Market competition stimulates companies to be innovative, but innovations are subject to market selection pressures which lead many innovations to fail. From an evolutionary perspective, the aim of innovation policy is *"to stimulate the generation of variety through innovation and to ensure that the feedback from the selection process does not operate to the detriment of the variety generation process"* (Metcalfe, 1994, p. 933, based on Smith, 1991). R&D support is the main policy to increase diversity but innovation may also be stimulated through fostering cooperation, organising (innovation) systems (national ones and technology-specific ones), the development of platforms for learning and experimenting, the creation of strategic intelligence and stimulating demand articulation, strategy and vision development (Smits and Kuhlmann, 2004). To different degrees, governments engage into such activities.

However, political governance is an under-studied topic in the field of R&I policy. A Web of Science[5] query[6] returns only 12 published items in the field by February 1, 2015. The most cited political governance article relatable to the field of R&I policy is an article on social innovation by Erik Swyngedouw (231 times). The second most cited article is the article *"Future governance of innovation policy in Europe"* by Stefan Kuhlmann (60 times). However, for the purposes of this article, the most important article is by Susana Borrás: "*The Widening and Deepening of Innovation Policy: What Conditions Provide for Effective Governance*". In her paper, Borrás (2008) constructs an analytical toolbox based on a series of theoretical assumptions about political conditions for effective governance of innovation systems and discusses these six political conditions that each of which comes with their own analytical criteria for effective governance. These conditions identified by Borrás (2008) are: 1) A strategic innovation policy, 2) A positive administrative coordination of innovation policy at the middle level of executive departments, 3) A balanced diversity creation and market selection, 4) A clear distribution of roles between public and private actors, 5) Policy learning 6) Public legitimacy and accountability.

According to Borrás (2008), these conditions listed are in need of empirical investigation because of the fact that *"solid empirical evidence of positive and negative political conditions would allow us to take more assertive stances about policy implications with systemic design effects, and hopefully place more emphasis on the overall socio-political dynamics of the ever-changing systems of innovation"* Borrás (2008). We undertake a test with the help of expert-based quantitative information about the effectiveness of R&I policy and proximate governance determinants of it. It should be noted that our

[5] Web of Science (WoS): online subscription-based scientific citation indexing service maintained by Thomson Reuters that provides a comprehensive citation search by giving access to multiple databases that reference cross-disciplinary research, which allows for in-depth exploration of specialised sub-fields within an academic discipline.
[6] TOPIC: ("Political governance" AND ("innovation" OR "research") AND policy) OR TITLE: ("Political governance" AND ("innovation" OR "research") AND policy) by October 27, 2014

study differs from Borrás (2008) in three ways. Following the literature and review of analytical conditions, firstly, the conditions are converted into influence variables based on the work of Foucault (1980; 1982) and Colebatch et al. (2010) such that we examine the system of influence introduced by *power and knowledge holders* , *agents* (See Section 2.5 Table 1, Column 2 and 3). Secondly, we take an *action-based actor-centred approach* of proximate political governance (See Table 1, Column 3), and thirdly, we concentrate on the importance of the proximate governance influence variables, other than ultimate influence variables (See Table 1, Column 4) with rigorous tests with the help of quantitative-qualitative approaches (Borooah, 2002; Ragin, 1987; 2000).

2.1 The relevance of a governance policy: State and market interactions in R&I policy

In this section, we state the relevance, especially policy relevance of political governance. Nelson (1995) indicates the supremacy of market selection over central planning in R&I-related activities. Metcalfe (2007) agrees with Nelson that market competition offers strong incentives to innovate but sees a positive role for governments to enhance variety generation to counteract variety-destroying selection pressures. The creation of incentives to stimulate creation is called the "conduct of conduct" by Foucault (1980, 1982). Borrás (2008) stresses the importance of *"a balanced diversity creation and market selection"* that comes with *"the enforcement of the principle of additionality by prudent diversity creation and evidence that governmental action secures incentives for market selection process"* as a political condition. Balancing diversity creation with market selection is a difficult act given the information problems about the need for innovation support and efficacy of incentives. The degrees to which the use of *governmental technologies*[7], such as regulatory impact assessments, and the degrees to which the use of *technologies of participation* by inclusion of ministerial field-knowledge in order to help to make better policy choices are points for debate. Such instruments and instruments choices are always surrounded by information problems as well as problems of legitimacy and acceptance[8] (Borrás and Edquist, 2013). Innovation systems interact with political systems in complex ways. Politicians and agencies for innovation are approached by innovation actors to give them support, in making choices they are advised by innovation policy experts on innovation policy approaches and influenced by policy agendas, especially the agenda of the ruling party or coalition (Swyngedouw, 2005). In the following subsection, we scrutinise this interaction field between political systems and innovation systems.

[7] Governmental technologies from Foucauldian perspective also denotes *"a complex of practical mechanisms, procedures, instruments, and calculations through which authorities seek to guide and shape the conduct and decisions of others in order to achieve specific objectives"* (Lemke, 2007).

[8] Borrás and Edquist (2013) assert that "in advanced representative democratic systems, political parties tend to disagree on the type of policy instruments to be chosen and how they should be designed. The same applies to the citizens and the public in general, since their implicit or explicit endorsement of policy instruments is crucial for the sustainability and effectiveness of the policy instrument. An instrument that is no longer legitimate runs the risk of being popularly contested or falling into disuse, hence making its correct implementation difficult. This might compromise its effectiveness and expected results. If contestation is fierce and widespread, governments and their public agencies might reconsider the specific contents of an instrument, or even the entire instrument as such." (Borrás and Edquist, 2013)

2.2 Political systems and innovation systems: A co-evolution perspective

Kuhlmann, in his article about future governance of innovation policy in Europe, conceptualises the interaction between the state and market as *co-evolution of political systems* and *innovation systems* (Kuhlmann, 2001). Especially in the context of the EU, Kuhlmann states the importance of political system at the national level for R&I policy choices -the unit of analysis in this article- for "*national political authorities continue to fulfil crucial tasks in transnationally inter-mingled socio-economic settings"* (Kuhlmann, 2001). He states that:

> *"…It seems plausible that the institutions of national political systems will in any case continue to play an important role, even if the governance of innovation policy in Europe becomes more "postnational": nation states functioning at least ideally as guarantors of the rule of law "on the spot" as well as providing legitimization for the growing number of transnational political arrangements"* (Kuhlmann, 2001).

The range of actors involved in innovation policy is widening. The increasing involvement of societal actors in innovation policy has given rise to "politics of information". In their recently edited book, Blom and Vanhoonacker (2014) citing Hooghe and Marks (2001) state that *"concern about the control over information and expertise is gradually replacing the erstwhile concern with the monopoly of the state of the legitimate means of (eventually violent) coercion for the case of Western societies*[9] *especially during the second half of the 20th century*" Blom and Vanhoonacker (2014). Citing Stehr (1994), Blom and Vanhoonacker (2014) further state that:

> *"In knowledge societies, (...) knowledge, rather than more traditional form of coercive power, becomes the dominant and preferred mean of constraint and control of possible action"* Blom and Vanhoonacker (2014).

In relation to R&I policy, Borrás (2008) conceptualises these concerns about governing the institutionalisation processes of the use of information and expertise in terms of "*governmental action(s) conducive to changing and adapting the institutional framework in the innovation system in a way that enhances innovation performance in the economy and society"* in defining what effective governance is (Borrás, 2008). In the following subsection, we discuss the literature on this topic.

2.3 Learning for policy-makers: A heterarchical learning perspective

Edler et al. (2003) states that new modes of governance and relatedly government would require 1) A broader understanding of public policies for innovation (more systemic with special attention to horizontal governance relations), 2) A set of overarching goals for horizontal and systemic innovation policy, 3) Success factors facilitating achievement of innovation policy goals (Edler et al., 2003). From a knowledge point of view, in the governance of politico-administrative systems and public innovation policy, we not only have information asymmetries but also very large uncertainties about

9 "Alternatively labelled as "post-industrial", "information", "knowledge" and more recently "risk" and "network" societies" Blom and Vanhoonacker (2014)

the benefits policy interventions (which depend on the unknown benefits of the innovations). Kemp (2011) states that *"uncertainty as to the effects of policy instruments call for policy learning"* (Kemp, 2011). Malik and Cunningham indicate that such "*learning relates to the explicit openness of policy-makers to take on board the lessons from the successes and failures of both their own policy experiences and those of others"* (Malik and Cunningham, 2006). Though, Borrás and Edquist (2013) assert that *"in the everyday process of policy-making, many instruments are developed as a mere continuation of existing schemes, or with poor consideration of the expected effects"* [10] (Borrás and Edquist, 2013). With respect to what to learn (and forget[11]), in order to target cross-cutting societal challenges[12] with technologies of government, Borrás and Radaelli (2010) in a report about the *smart regulation* agenda see a positive role for using tools such as regulatory impact assessment, the standard cost model, and ex-post evaluation of regulatory regimes, at national level, which can also generate capacity for further coordination *across policy problems* at international level.

Borrás (2008) contends that "*a positive administrative coordination of innovation policy at the middle level of executive departments"* requires *"the existence of explicit and co-operative mechanisms of vertical and horizontal coordination"* and *"evidence of clear patterns of actor's interactions explicitly conducive to reduce redundancies and enhance complementarity and synergy of governmental actions"* as the analytical criteria for this political condition (Borrás, 2008). In policy work, "*there has been a shift from a hierarchical and instrumental, outcome-oriented focus to an interactive, process-oriented one*" (Colebatch et al., 2010, p.230). According to Colebatch et al. (2010) policy workers in each ministry/department "*spent much of their time negotiating with policy workers from other organizations, attempting to find a mutually acceptable and justifiable outcome*" (Colebatch et al., 2010, p. 229). By delving into these details of political and administrative organisation of national governments, Arnold and Boekholt (2003) have distinguished four institutional levels in the political system that is relevant to innovation policies (Braun, 2008). Braun (2008) places the first three political levels as: *i) government and the cabinet level, ii) sectoral ministry level,* and *iii) agency level*. These three political levels constitute the institutional matrix of political governance that connects to both national level systems, such as knowledge spaces, and supra- or international level systems.

In short, this subsection reasserts the importance of national level sectoral/line ministries and heterarchical learning across policy fields through the use of sophisticated tools, such as regulatory

[10] This is confirmed by Nauwelaers and Wintjes (2008) for the case of EU innovation policy about which they say that policies are usually a follow-up on existing policies with a small role for policy evaluations of their effectiveness and efficiency.
[11] Stegmaier, P., Kuhlmann, S., & Visser, V. (2012, March). Governance of the Discontinuation of Socio-Technical Systems. In Governance of Innovation and Socio-Technical Systems in Europe: New Trends, New Challenges' International Workshop, Copenhagen Business School, Denmark (pp. 1-2).
[12] The societal challenges are social (e.g., youth unemployment), economic (e.g., public debt) and environmental (e.g., CO_2 emissions) and temporal dimensions (short, medium, long-term) are also concerned.

impact assessment tools extended with sustainability checks, on social, economic and environmental cross-cutting challenges, incorporating academic and industrial expert knowledge into formation of exhaustive set of indicators used in such tools in order to assess already existing or prepared formal legal acts because of the approach that effective governance can be defined as "*a rapid adaptation of the formal institutional framework in the innovation system"* Borrás (2008). This is a condition that comes with *"evidence that the formal institutional framework is adapting rapidly"* and "*evidence that recent adaptations in the formal institutional framework have been conducive to the desired levels and patterns of innovative performance"* (Borrás, 2008). This *formal* institutional framework can only be changed, adapted by laws, regulations and directives. Rapid adaptation of formal institutional framework and its performance assessments require a networked regulatory intelligence and cross-cutting regulatory impact assessments. This network can be based on formal, informal coordination or communication, hence we picked our three (formal, informal coordination, communication) influence variables relating to varieties of inter-ministerial coordination relying on these theoretical/analytical arguments.

2.4. R&I policy, public legitimacy and accountability: Socio-technical and socio-political interactions

The influence of the general public is more indirect and often over morally-charged specific issues. In this respect, Borrás (2008) writes:

> *"The allegedly 'technocratic' nature of innovation policy has been challenged during the past decades by social and political unease on topics such as stem cell research, software patent regulations, or the risks associated with the release of genetically modified organisms (GMOs)"* (Borrás, 2008).

However, social and political concerns of citizens not only relate to social and political issues that comes with introduction of risky innovations, they also relate to basic calculations of efficiency or effectiveness of public spending, whether the promised targets are reached or not, failures and success in policy choices, several governmental decisions relating to education, vocational training, higher education scholarships and so on. Van Asselt and Vos (2008) indicates that *"the innovation process is a complex social and economic process meaning that the social sustainability of innovation process is inevitably associated with the ways in which popular criticism and concerns about innovation-related phenomena are politically dealt with"* (Van Asselt and Vos, 2008). According to Borrás (2008), the political condition of *public legitimacy and accountability* comes with "*the existence of well-endowed participatory frameworks in the innovation policy-making process complementing formal democratic channels"* and *"evidence of political accountability in innovation-related matters"* (Borrás, 2008).

Formal democratic channels are proximate, and driven by the debates in parliamentary committees, parliamentary activities in monitoring and opposing to the governmental decision thanks to democratic

discourse and practice; and by media reporting activity in terms of political reporting (publicising the governmental decisions) to the general public, to the electorate. Although the content of the debates could vary, the most important one is *"a clear distribution of roles between public and private actors",* that comes with "*extended formalized contractual agreement between partners in complex and 'grey' zone of public-private partnerships"* and *"evidence of conditionality of public involvement in these types of public-private interactions"* (Borrás, 2008). Depending on their visibility, these criteria are accountable to evaluation by parliamentary committees (debating the grey zones and conditionality criteria of public involvement) and media (publicising what is going on with respect to these criteria) have an immediate, competitive (rival parties) and communicative (media) eye, surveillance, on the policy work of governments.

According to Borrás (2008), the political condition of *"a strategic innovation policy"* comes with "*the existence of an explicit political vision and priority-setting"* and *"evidence that the vision and priorities are transposed to the choice, design and implementation of innovation policy instruments"* (Borrás, 2008). From the perspective of political governance and policy work, this can be extended in the following way. In democratic settings at national level and at the EU-level, political visions and priorities can vary amongst different political parties, competitive ideas and interests of rival political parties can exist even if these parties are not in the power, they can be in the parliament and parliamentary committees (De Ruiter, 2010; 2013; 2014; Borrás and Radaelli , 2014). The ways of translation of political vision and priorities to the choice, design and implementation can also vary with respect to the several political options available about the characteristics of *technologies of participation* and *governmental technologies* (Foucault, 198o; 1982). Governmental technologies here denotes *"a complex of practical mechanisms, procedures, instruments, and calculations through which authorities seek to guide and shape the conduct and decisions of others in order to achieve specific objectives"* (Lemke, 2007).

2.5 Our framework: Proximate political governance determinants of R&I policy

Our model of effective governance differs from the model of Borrás (2008), which is conceptually richer but not prone to (econometric or set-theoretic) one-to-one operationalisation, preventing us from using it in a direct way in our regression and set-theoretical analyses. However, following our review and theoretical/analytical mapping, as proximate factors other than remote factors inside the national political systems relating to R&I policy in the EU-28, we investigate the role of five "governance" determinants of effective R&I policy. Each condition -primarily driven by institutional or agential actors- can be considered as of the most proximate influence variables for the policy operations of governments. In our models of proximate governance, we have two variables of external surveillance (media and parliamentary committees/socio-political), and three variables of self-surveillance (assessment and scrutiny by politico-administrative coordination, and societal consultation). These

determinants are called governance determinants because each of them involves particular mechanisms through which not only knowledge but also concerns and voices are brought to bear on government policy (Grossman and Helpman, 1996). Of the five variables, resources of *parliamentary committees* enabling monitoring and opposing governmental decisions, and *media* informing citizens on the policy decisions of governments (and offering a platform for raising awareness and discussing them) constitute the most proximate and the most immediate sources of pressure that governments have to deal with. The surveillance of governmental policy actions (by political opponents in parliamentary committees and media) is believed to have a very important influence on government policy in that it necessitates a reaction from responsible ministers. The influence of using advanced regulatory impact assessments extended to sustainability checks and capacity to coordinate policy action across ministries are also very proximate and therefore considered important for the formulation of effective policies and adjustment of policy proposals in response to sophisticated sectoral knowledge and overall sustainability pressures and demands coming from the societal ideas and interests. Therefore, our model offers a systemic interplay between ideas, interests and institutions (Hall, 1997).

Table 1 – Mapping the theoretical backgrounds of variable selection

Political conditions provide for effective governance (Borrás, 2008)	**Mapped into theoretical background**	**Proximate Political Governance (Our constructs)**	**Remote Political Governance (World Bank)**
"A positive administrative coordination of innovation policy at the middle level of executive departments" (OECD, 2005; Braun, 2008)	Technologies of participation (Foucault; 1980; 1982)	Administrative (*formal, informal, communicative)* coordination	Government Effectiveness
"A strategic innovation policy"	Policy work (Colebatch, Hoppe and Noordegraaf, 2010)	Inclusion of civil society, academics, business into policy process (*Societal consultation*)	Political Stability and Absence of Violence
"Policy learning" (Malik and Cunningham, 2006)	Governmental technologies (Foucault, 1980; 1982)	Regulatory impact assessment extended to sustainability checks	Regulatory Quality
"A balanced diversity creation and market selection" (Nelson, 1995; Metcalfe, 2007)			Control of Corruption
"A clear distribution of roles between public and private actors"	Interaction between Socio-technical and Socio-political governance (Kooiman, 1993; Tsakatika, 2007)	National Parliamentary Committees	Rule of Law
"Public legitimacy and accountability" (Van Asselt and Vos , 2008)		National Media	Voice and Accountability

In Table 1 above, "A positive administrative coordination of innovation policy at the middle-level of executive departments" (OECD, 2005; Braun, 2008) is mapped as one of the technologies of participation (Foucault; 1982). We analysed this administrative coordination aspect with respect to

three varieties: formal, informal coordination or communication-based coordination[13]. Formal "inclusion of sectorial line ministries into policy proposals" is an instance of formal coordination, while "complementary informal inter-ministerial coordination" is an instance of informal mechanisms in politico-administrative coordination; "vertical and horizontal policy communication" concentrates on the discursive coherency in policy action. All variables are further discussed in Section 3.

3. Data, Hypotheses and Methods

3.1 Data

The main body of the data is of Bertelsmann Stiftung Sustainability Governance Indicators (SGI) 2014[14], assessing a period of two years, beginning May 1, 2011 and ending May 15, 2013 and consists of comparability between earlier review periods dating back to January 2005, through experts' exclusively focusing on developments within the period under investigation[15]. There are limitations to data, however we think that we can reasonably capture all of these limitations by the choice of methods of analyses and strong theoretical arguments about political saliency of R&I and R&I policy as it is indicated in the literature (Borrás, 1999; Braun, 2008; OECD, 1996; 2005a; 2005b).

One limitation of data is that they are based on country experts' subjective judgements about policy effectiveness and policy governance aspects[16]. The second limitation is that 28 countries of the EU constitute a small N (as sample size) from the point of view of regression analysis. The third limitation is that the explanatory variables/conditions are of generic kind not R&I policy-specific, meaning that they are not measured specifically for the R&I policy, such as resources of parliamentary committees to monitor and oppose governmental action in R&I-related topics, but they are more of an overall assessment of governance capacity. For the purposes of our study they are the best data available. For our variables there are no good objective-measures, efforts have been made to ensure the validity of these expert assessments. The assessments of the SGIs Expert Network undergo a six-stage peer review within their concise framework which ensures the validity and reliability of these expert assessments that also asks for factual evidence behind this qualitative assessment[17]. As for the sample size, whereas N of 28 countries is small for regression-based analysis, it is rather large for set-theoretic analysis. Regarding the general nature of the determinants of R&I policy effectiveness, we can reasonably expect that R&I policies are more scrutinised to evaluation in countries where policy

[13] Please see March and Olsen (2006) for the role of formal and informal institutions and Schmidt (2008) for discursive institutions.
[14] The SGI is a platform built on a cross-national survey of governance that identifies reform needs in 41 EU and OECD countries. http://www.sgi-network.org/2014/ all values are between 1 and 10. The SGI data relies on a combination of qualitative assessments by country experts http://www.sgi-network.org/2014/Expert_Network and quantitative data drawn from official sources.
[15] ibid
[16] Source: SGI Network http://www.sgi-network.org/2014/FAQ
[17] ibid

discussions by parliamentary committees is common and advanced methods of Regulatory Impact Analysis (RIA) are being used. Varieties of administrative coordination and the use of RIA tools with sustainability checks as generic traits can be expected to equally apply to R&I policy. Indeed there is a great deal of evidence that R&I policy often and primarily involves horizontal and vertical coordination (Borrás, 2008; Braun, 2008; OECD, 1996; 2005a; 2005b).

3.1.1. The dependent variable / the outcome

The dependent (ordinal) variable is *"Research and Innovation Policy Effectiveness*" (RIPE) which a measure of the extent (1-10) to which *R&I policy* supports technological innovations that fosters the creation and introduction of new products and enhanced productivity[18]. See appendix for tabulation of dependent variable.

3.1.2 Explanatory variables / the conditions

Abbreviations are as follows: Inclusion of Sectorial Line Ministries (ISLM); Complementary Informal Inter-ministerial Coordination (CIIC); Policy Communication (VHPC); Media Attention/Coverage of R&I Policy and Politics (MCRIPP); Parliamentary Committees' Resources (PACR); RIA with Sustainability Checks (RIASC); Societal Consultation (SPEC):

3.1.2.1 Inclusion of Sectorial Line Ministries **(ISLM)** is a measure of the extent (1-10) to which sectoral/line ministries formally involve in the government office/prime minister's office (GO/PMO) in the preparation of policy proposals, whether sectoral/line ministries involve the GO/PMO in the preparation of policy proposals at government – ministry executive interface.

> *"Inter-related capacities for coordination in the GO/PMO and line ministries at policy proposal level"* [19]

This indicator[20] is taken as a pressure on R&I policy for existence of ever-getting-sophisticated, cross-cutting sectoral knowledge that is needed to formulate R&I policy. In the political governance matrix, sectoral/line ministries, from the perspective of bottom-up modern governance, are the closest units to the field-knowledge (Kooiman, 1993; Hoff, 2003; Braun; 2008) therefore, very proximate in contributing into governmental policy work. For instance, in the Netherlands, "Generally, the initiative by a line ministry to start drafting new legislation or a white paper is rooted in the government policy accord, EU policy coordination and subsequent Council of Ministers decisions to allocate drafting to one or two line ministries. With complex problems, draft legislation may involve considerable jockeying for position among the various line ministries" (SGI, 2014).

[18]Source: SGI Network http://www.sgi-network.org/docs/2014/basics/SGI2014_Codebook.pdf
[19] ibid
[20] Relates to Section 2.1 relevance of a governance policy, Section 2.2 co-evolution of knowledge, Section 2.3 policy makers' heterarchical learning

H1: The more the line ministries involve the government office/prime minister's office in the preparation of policy proposals, the more likely a research and innovation policy that effectively supports innovations is designed.

3.1.2.2 ***Complementary Informal Inter-ministerial Coordination*** **(CIIC)** is a measure of the extent (1-10) to which informal coordination mechanisms (e.g., coalition committees, informal meetings within government or with party groups, informal meetings across levels of government) effectively complement formal mechanisms of inter-ministerial coordination. Inter-ministerial coordination fosters heterarchical learning, and is a proximate influence factor on policy work.

> *"How effectively do informal coordination mechanisms complement formal mechanisms of inter-ministerial coordination?"* [21]

For instance, in Finland "Inter-sectoral coordination has generally been perceived as an important issue, but rather few institutional mechanisms have in fact been introduced. One of these is the so-called *iltakoulu*, or evening session, which is an unofficial negotiation session of the Cabinet. To a considerable extent, though, coordination proceeds effectively through informal mechanisms." (SGI, 2014)

H2: The more the informal coordination effectively complements formal mechanisms of inter-ministerial coordination between layers of government, the more likely a research and innovation policy that effectively supports innovations is designed.

3.1.2.3 ***Policy Communication*** **(VHPC)** is a measure of the extent (1-10) to which whether the government achieves coherent policy communication by (a) effectively coordinating the communication activities of ministries and (b) sending messages that are factually coherent with the government's plans.

> *"To what extent does the government achieve coherent communication?"* [22]

Government coordinates policy communication to ensure ministerial statements align with government strategy. For instance, in Lithuania, "Prime Minister Butkevičius has himself publicly made contradictory statements on such politically important issues as tax reform or the future of nuclear power in Lithuania, probably reflecting the diversity of opinions within his party and the ruling coalition"(SGI, 2014).

H3: The more coherent the policy communication between layers of government is, the more likely a research and innovation policy that effectively supports innovations is designed.

[21] ibid
[22] ibid

3.2.2.4 ***RIA with Sustainability Checks (RIASC)*** is an indicator of the extent (1-10) to which the government conducts effective sustainability checks within the framework of regulatory impact assessments.

> *"Sustainability checks are an integral part of every RIA; they draw on an exhaustive set of indicators (including social, economic, and environmental aspects of sustainability) and track impacts from the short- to long-term. Effective sustainability checks fulfil three criteria. First, they are integrated into RIAs in order to form a common basis for decision-making rather than standing on their own. Second, they draw on an exhaustive set of impact indicators addressing social (e.g., youth unemployment), economic (e.g., public debt) and environmental (e.g., CO2 emissions) issues. Third, they analyse the impacts on such indicators in the short-, mid-, and long-term."* [23]

Regulatory impact assessment extended to sustainability checks helps policy makers to consider the likely impacts of policies, not only the positive outcomes but also possible negative outcomes in terms of employment, environmental effects and tax revenues. The assessment of the potential impacts of existing and prepared legal acts is a proximate influence variable. The existence of RIA with sustainability checks acts as a counterbalance to favouritism and privileges in access to government, in that the pros and cons of policy acts as explicitly considered. The influence of RIA on government policy is disputed in an evaluation of the OECD, saying that *"much remains to be done to cement RIA as an integral part of the policy decision-making process"*[24] as well as much remains to be cement concerns of sustainability as an integral part of RIA in decision making[25].

H4: The more the governments systematically assess the potential sustainability impacts of existing and prepared legal acts, the more likely a research and innovation policy that effectively supports innovations is designed.

3.2.2.5 ***Parliamentary Committees' Resources (PACR)*** is an indicator of the degree (1-10) to which members of parliament as a group can draw on a set of resources suited for monitoring all government activity effectively.

> *"In order to effectively monitor government activity, members of parliament must possess the resources to obtain self-produced or independent information and expertise. Resources like deputy expert staff, or administrative support staff (e.g., parliamentary libraries or parliamentary research units) as well as monetary allowances for the commission of independent research are key preconditions for effective monitoring."* [26]

This indicator is considered an important influence variable for policy, including R&I policy. Well-informed criticisms and suggestions for policy from parliamentary committees, especially when picked up by the media, can be expected to constitute an important source of influence on government policy in requiring a response from responsible authorities, forcing them to ponder policy alternatives.

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[23] ibid
[24] Source: OECD, http://www.oecd.org/gov/regulatory-policy/42047618.pdf
[25] Source: OECD, http://www.oecd.org/gov/regulatory-policy/Sustainability%20in%20impact%20assessment%20SG-SD%282011%296-FINAL.pdf
[26] ibid

On top of these in-house (national) parliamentary committee resources, a case relating to this variable is given where parliamentary actors from different European countries come together and reflect on R&I policy. These actors require in-house resources to effectively participate into exchange of views on international level. For instance, on April 8, 2014, the PACITA[27] partners organised a 2nd Parliamentary debate in Lisbon, where the project partners and other interested institutions from various spheres participated together with parliamentarians from the PACITA partner countries in order to discuss current issues regarding technology assessment[28].

H5: The more the Parliamentary Committees' Resources enable effective monitoring of government activity by members of parliament, the more likely a research and innovation policy that effectively supports innovations is targeted to be designed by governments

3.2.2.5. ***Media Coverage of R&I Policy and Politics (MCRIPP*)** is a variable of media coverage in R&I policy and politics. The number of news items on the theme of "R&I policy and politics" is gathered for each Member State from Lexis Nexis[29] database for the period of 1 May 2011-15 May 2013. This period is also the assessment period of the other variables in our analysis.

> *"To what extent do the media provide information to broader public under the theme of R&I policy and politics?"*

This indicator is considered to constitute an influence factor on R&I policy for information about R&I policy incorporating a dimension of politics is being publicised by media and circulated about governments' R&I policy-related decisions. Much of the influence of the journalists, in democracies, is through the media, in making the public aware of the effects of government policies and offering channels for people to express their views about the policies responsible for the effects. Media has further role in acting as a surveillance mechanism on governmental decisions, at the same time, it informs citizens about policy, raises policy awareness, and increases potential policy response from broader public. A case of this variable can be exemplified as follows. Different societal actors indicate views on a governmental decision on R&I policy in a news item titled "George Osborne pledges extra £600m for science to stimulate growth" by The Guardian[30]. George Osborne, a politician; David Willets, a minister; Imran Khan, a director of a civil society campaign; Paul Nurse, president of Royal Society, and appreciation and critics from scientific community in response to an R&I policy intervention is publicised by the newspaper.

H6: The more the media provide news items enabling the broader public to be aware of governmental R&I policy decisions, the more likely a research and innovation policy that effectively supports innovations is targeted to be designed by governments

[27] PACITA ("Parliaments and Civil Society in Technology Assessment") is an international project financed by the 7th Framework Programme, Science in Society. Project lasts four years – from April 2011 till March 2015. http://pacita.strast.cz/en/about-the-project
[28] ibid
[29] Source: Lexis Nexis, http://academic.lexisnexis.eu/
[30] Source: The Guardian, http://www.theguardian.com/science/2012/dec/05/george-osborne-science-stimulate-growth

3.2.2.7 ***Societal Consultation (SPEC)*** is a measure of the extent (1-10) to which how successfully the government consults with societal actors such as trade unions, employers' associations, leading business associations, religious communities, and social and environmental interest groups in preparing its policy. For a quantitative discussion on the selection of this variable with respect to distal variables, see appendix and/or supplementary file.

> *"How successful is the government in exchanging of views and information (beginning at an early stage of policy development and continuing through to policy implementation) that increases the quality of government policies and induces societal actors to support them?"*[31]

For instance in Denmark, "there is a long tradition of involving economic and social actors at all stages of the policy cycle, even sometimes in the implementation phase. Both formally and informally, there are good contacts between the government administration and the main interest organisations (e.g., trade unions, employers, various business organisations and NGOs), as well as heads of major companies. Interest organisations provide important information for politicians and civil servants. While corporatism has changed over the years, it still exists in Denmark[32]" (SGI, 2014).

H7: The more the government is successful in societal consultation at early stages and in implementation phases, the more likely a research and innovation policy that effectively supports innovations is present.

Table 2 – Descriptive Statistics

Variable	N	Mean	Std. Dev	Min	Max
Research and Innovation Policy Effectiveness	28	5.321	1.982	3.000	9.000
Inclusion of Sectorial Line Ministries (ISLM)	28	6.857	2.206	3.000	10.000
Complementary Informal Inter-ministerial Coordination (CIIC)	28	6.893	1.912	3.000	10.000
Policy Communication (VHPC)	28	6.071	2.159	2.000	10.000
RIA with Sustainability Checks (RIASC)	28	4.607	2.601	1.000	10.000
Societal Consultation (SPEC)	28	5.893	2.132	2.000	10.000
Parliamentary Committees' Resources (PACR)	28	6.643	2.094	2.000	9.000
Media Coverage of R&I Policy and Politics (MCRIPP)	28	67.714	123.758	2.000	607.000

We ran several tests for data quality (See appendix for STATA outputs[33]). No substantial collinearity is observed for the system of variables. As we expected, highly correlated three varieties of administrative coordination have better be separately incorporated into models to avoid multicollinearity (Condition numbers above 15).

[31]Source: SGI Network http://www.sgi-network.org/docs/2014/basics/SGI2014_Codebook.pdf
[32]Henning Jorgensen, Consensus, Cooperation and Conflict: The Policy Making Process in Denmark, 2002.
[33]These are Skewness/Kurtosis tests for Normality, Spearman Correlations, Collinearity Diagnostics I - No individual VIF value is above 10 or tolerance below 0.1, Collinearity Diagnostics II - No condition number above 15 or 30.

3.2.1 Method I: Ordered Logit Econometric Estimations and Results

Ordered logit estimations have been developed for studying the relationship between an ordinal or categorical dependent variable and the independent variables. Our R&I policy effectiveness indicator, the dependent variable, is an ordinal variable. The actual values taken on by the dependent variable are irrelevant, except that larger values are assumed to correspond to "higher" outcomes[34]. Table 3 below shows the ordered logit regression results keeping four influence variables fixed and controlling for varieties of inter-ministerial coordination, namely formal, informal coordination and communicative coordination.

Table 3 – Regression Results

Dependent Variable:	**Model 1**	**Model 2**	**Model 3**
Research and Innovation Policy Effectiveness	**Formal Coordination**	**Informal Coordination**	**Communicative Coordination**
Influence Variables:			
Line Ministries Inclusion to Policy Proposals	0.377		
	(0.249)		
Informal Inter-ministerial Coordination		**0.428***	
		(0.237)	
Policy Communication			**0.593***
			(0.314)
Societal Consultation	**0.874*****	**0.784*****	**0.836*****
	(0.274)	(0.265)	(0.259)
RIA extended to Sustainability Checks	**0.420****	**0.418*****	**0.281***
	(0.183)	(0.162)	(0.155)
Parliamentary Committees' Resources	**0.546****	**0.503***	**0.749****
	(0.26)	(0.257)	(0.36)
Media Coverage of Government RI Policy Decisions	**0.007****	**0.007****	**0.009*****
	(0.003)	(0.003)	(0.003)
cut1	9.809***	9.446***	11.31***
_cons	(2.636)	(2.107)	(3.915)
cut2	12.81***	12.66***	14.52***
_cons	(2.866)	(2.676)	(4.054)
cut3	14.78***	14.42***	16.42***
_cons	(3.351)	(2.909)	(4.361)
cut4	16.29***	15.70***	17.96***
_cons	(3.566)	(3.009)	(4.588)
cut5	18.24***	17.51***	20.14***
_cons	(3.508)	(2.869)	(4.663)
cut6	20.09***	19.45***	22.28***
_cons	(3.864)	(3.117)	(5.011)
Omodel test: Approximate likelihood-ratio test of proportionality of odds across response categories (all above 10%):	chi2(25) = 32.38 Prob > chi2 = 0.1473	chi2(25) = 33.71 Prob > chi2 = 0.1142	chi2(25) = 33.53 Prob > chi2 = 0.1184
Member States	**28**	**28**	**28**
Standard robust errors in parentheses / Star-levels * p<0.10, ** p<0.05, *** p<0.01			

[34]Source: STATA Corporation: Ordered Logit, http://www.stata.com/manuals13/rologit.pdf

Results of the ordered logit analyses given in Table 3 indicate that as hypothesised, individually, all variables are statistically significant for proximate political governance models incorporating informal coordination and communicative coordination[35]. The higher the number of R&I-related news items, media attention (Odds ratio: 1.007), the higher the use of RIA tools with sustainability checks (Odds ratio: 1.519), the higher the complementary informal inter-ministerial coordination (Odds ratio: 1.535), the higher the availability of parliamentary committee resources (Odds ratio: 1.654) and the higher the openness of governments to policy entrepreneurs (Odds ratio: 2.191), the more likely, a higher probability that an effective R&I policy is observed. Of the greatest marginal effect is for societal consultation, followed by parliamentary committees' resources, complementary informal coordination and sustainability checks extension, followed by media attention[36]. The high positive effect of openness of government to external societal policy actors/entrepreneurs is a notable result. In the following section, we analyse multi-way interactions with a set-theoretic analysis for Model No 2: complementary informal administrative coordination variant of proximate political governance.

3.2.2 Method II: Fuzzy-Set Qualitative Comparative Analysis (fs/QCA) and Results

The configurational influence of the five conditions is investigated with the help of fs/QCA developed by Ragin (1987; 2008a; 2008b). Fs/QCA analyses (with respect to presence and absence of the outcome) are based on set-relations of the conditions instead of correlations between them (Grofman and Schneider, 2010). Set-relations here denote whether comparative values of conditions consistently higher or lower than each other indicating a super/sub-set relation. Fuzzy-sets are useful in calibrating partial memberships in sets without abandoning the core set-theoretic principles, such as subset relations (Pustovrh and Jaklic, 2014). We apply fs/QCA analysis to these case characteristics (conditions). Case characteristics are not "variables" in the usual sense, but degrees of membership of a defined category. These conditions may potentially be necessary or sufficient for the outcome to happen. With the help of Boolean logic, causal configurations of necessity and sufficiency are investigated. A unique aspect of fs/QCA is that it allows the researcher to investigate multi-way interaction effects between different conditions, such as different sufficient combinations of conditions leading to the same outcome, hence different policy alternatives. All analyses are done with the use of fs/QCA 2.0 Software, for it is a standard of good practice for fs/QCA, Schneider and Wagemann (2010). Limits of fs/QCA are its mean-average temporality and the rather absolute application of logic. However, it is being applied in public policy analysis[37]: 143 applications between 1992 and 2011 are

[35] Formal inclusion of line ministries, not significant, only at 13%, directs our attention to complementary informal coordination model, Model No 2.

[36] See additional reports in appendix for Measures of fit, ordered logit Percentage change in odds, Odd Ratios, Marginal effects of each independent variable.

[37] fs/QCA has been applied by Pustovrh and Jaklic (2014) to investigate the causal patterns behind the innovation summary index success for 23 European countries. In their analysis, the effectiveness of research and innovation governance is investigated indirectly, through an investigation of innovation success which is related to 6 conditions: i) human resources index, ii) open, excellent and attractive research systems, iii) finance and support, iv) firm investments, v) linkages and

reviewed by Rihoux et. al (2011).The five operative steps of fs/QCA are 1) Calibration; 2) Analysis of necessary conditions; 3) Truth table minimisation; 4) Analysis of sufficient configurations; and 5) Assessment of the quality of results.

***i. Calibration*:** Calibration means transforming original values into fuzzy membership equivalents for each condition using threshold values as parameters of calibration. We used parameters of calibration (fully in: 9, crossover: 5, fully out: 2) based on the original SGI questionnaire and codebook[38].

Table 4 – Calibration: the Outcome, Five Conditions, Fuzzy Values

The Model		DEPENDENT VARIABLE/ OUTCOME	INFLUENCE VARIABLE 1	INFLUENCE VARIABLE 2	INFLUENCE VARIABLE 3	INFLUENCE VARIABLE 4	INFLUENCE VARIABLE 5
No	Member States	R&I POLICY EFFECTIVENESS OUTCOME	RIA TOOLS WITH SUSTAINABILITY CHECKS	PARLIAMENTARY COMMITTEES RESOURCES	MEDIA COVERAGE of RI POLICY AND POLITICS	SOCIETAL CONSULTATION	COMPLEMENTARY INFORMAL INTERMINISTERIAL COORDINATION
1	**Austria**	0,5	0,9	0,68	0,28	0,9	0,68
2	**Belgium**	0,68	0,02	0,95	0,99	0,82	0,95
3	**Bulgaria**	0,12	0,12	0,27	0,04	0,5	0,5
4	**Croatia**	0,12	0,27	0,68	0,03	0,27	0,27
5	**Cyprus**	0,27	0,12	0,12	0,56	0,5	0,27
6	**Czech Rep.**	0,5	0,68	0,95	0,56	0,5	0,82
7	**Denmark**	0,82	0,95	0,9	0,78	0,95	0,9
8	**Estonia**	0,82	0,5	0,9	0,45	0,9	0,82
9	**Finland**	0,95	0,95	0,95	0,51	0,98	0,98
10	**France**	0,82	0,12	0,82	1	0,68	0,9
11	**Germany**	0,9	0,9	0,95	1	0,82	0,68
12	**Greece**	0,12	0,02	0,68	0,93	0,05	0,68
13	**Hungary**	0,27	0,05	0,5	0,06	0,05	0,98
14	**Ireland**	0,5	0,27	0,5	0,73	0,27	0,9
15	**Italy**	0,27	0,27	0,9	0,87	0,27	0,9
16	**Latvia**	0,12	0,05	0,05	0,05	0,82	0,82
17	**Lithuania**	0,82	0,68	0,95	0,5	0,82	0,82
18	**Luxembourg**	0,68	0,12	0,9	0,05	0,9	0,98
19	**Malta**	0,27	0,12	0,12	0,02	0,5	0,27
20	**Netherlands**	0,9	0,82	0,68	0,63	0,95	0,82
21	**Poland**	0,68	0,82	0,95	0,32	0,82	0,82
22	**Portugal**	0,27	0,12	0,68	0,51	0,27	0,27
23	**Romania**	0,12	0,12	0,68	0,02	0,12	0,12
24	**Slovakia**	0,27	0,12	0,68	0,02	0,82	0,82
25	**Slovenia**	0,27	0,05	0,95	0,04	0,27	0,82
26	**Spain**	0,12	0,12	0,5	0,85	0,5	0,82
27	**Sweden**	0,95	0,82	0,95	0,59	0,9	0,9
28	**UK**	0,9	0,98	0,68	1	0,5	0,95

All data measures represent assessments covering the period of 2011-2013, calibration (fully in: 9, crossover: 5, fully out: 2) based on the original questionnaire and codebook, Source: http://www.sgi-network.org/docs/2014/basics/SGI2014_Codebook.pdf, the number of news items are calibrated as fully in: 108 (twice a week), crossover: 24 (twice a month), full out: 8 (twice a season).

ii. Analysis of the necessary conditions: A causal condition is called necessary if the instances of the outcome constitute a subset of the instances of the causal condition (Ragin, 2006). For a condition to be necessary, its membership score on the outcome (coverage) has to be consistently lower than the

entrepreneurship, and vi) intellectual assets. Their study is not so much a study of the governance but of innovation enablers and innovation activities of firms.

[38] Source: http://www.sgi-network.org/docs/2014/basics/SGI2014_Codebook.pdf

membership score (consistency) of the causal factor. When testing conditions for assessing necessity, the threshold for consistency should be high (> .9) and its coverage should not be too low (> .5) (Ragin, 2006).

Table 5 – Analysis of Necessary Conditions – Presence of the outcome

OUTCOME	**R&I Policy Effectiveness**	
Conditions tested:	**Consistency**	**Coverage**
RIA TOOLS WITH SUSTAINABILITY CHECKS	0.712758	0.902527
PARLIAMENTARY COMMITTEES RESOURCES	**0.942267**	**0.677254**
COMPLEMENTARY INFORMAL INTERMINISTERIAL COORDINATION	**0.975053**	**0.668622**
MEDIA COVERAGE of RI POLICY AND POLITICS	0.694227	0.727408
SOCIETAL CONSULTATION	**0.915182**	**0.771171**

Parliamentary committees' resources, societal consultation, complementary informal inter-ministerial coordination are necessary but not sufficient conditions for an effective R&I policy outcome, their single presence does not suffice in leading to the positive outcome.

Table 6 – Analysis of Necessary Conditions – Absence of the outcome

ABSENCE OF THE OUTCOME	**R&I Policy Effectiveness**	
Conditions tested: ABSENSE OF …	**Consistency**	**Coverage**
MEDIA COVERAGE of RI POLICY AND POLITICS	0.738726	0.706365
SOCIETAL CONSULTATION	0.727273	0.895154
PARLIAMENTARY COMMITTEES RESOURCES	0.549034	0.904481
RIA TOOLS WITH SUSTAINABILITY CHECKS	**0.922691**	**0.761820**
COMPLEMENTARY INFORMAL INTERMINISTERIAL COORDINATION	0.514674	0.953581

Absence of *"regulatory impact assessment with sustainability checks"* is a necessary condition for ineffective R&I policy.

iii. Analysis of sufficiency, Truth tables: In this step, in order to examine sufficient combinations of conditions leading to presence or absence of the outcome, the truth table minimisation algorithm[39] is applied and intermediate solution is shown which is recommended by Ragin (2008a, 2008b). Using 0.90 as the cut-off point for sufficiency, the algorithm leads to combinations of causal conditions and outcome shown in Table 7 (presence of the outcome) and Table 8 (absence of the outcome) where we can see the differences in causal asymmetries.

iv. Results

The solutions show that Parliamentary committee' resources (PACR), societal consultation (SPEC), informal inter-ministerial coordination (CIIC) is the core pattern which could either be complemented with RIA with sustainability checks (RIASC) or media attention (MCRIPP) in leading to effective R&I Policy. Approximately %75 of the cases is explained. Explained cases are mainly of Northern and Western Europe.

Table 7 – Sufficient combinations of conditions for effective R&I Policy

INTERMEDIATE SOLUTION[40]	**Raw Coverage[41]**	**Unique Coverage[42]**	**Consistency [43]**
MCRIPP AND **SPEC** AND **CIIC** AND **PACR +**	0.607270	0.099786	0.942478
SPEC AND **CIIC** AND **PACR** AND **RIASC**	0.658589	0.151105	0.943820
Solution coverage: (joint importance of all causal paths)	0.758375		
Solution consistency:	0.908625		
Cases with greater than 0.5 membership in pressure combinations term (1)	Belgium (0.82,0.68), Denmark (0.78,0.82), France (0.68,0.82), Germany (0.68,0.9), NLD (0.63,0.9), Sweden (0.59,0.95), Finland (0.51,0.95)		
Cases with greater than 0.5 membership in pressure combinations term (2)	Finland (0.95,0.95), Denmark (0.9,0.82), Poland (0.82,0.68), Sweden (0.82,0.95), Austria (0.68,0.5), Germany (0.68,0.9), Lithuania (0.68,0.82), NLD (0.68,0.9)		

"*":AND, presence of both conditions, +: presence of either condition or of both conditions, overall consistency cut-off: 0.897822, calculation with fsQCA 2.0 software (www.fsqca.com)

[39] Truth table solution is a list of different combinations of causal factors that have met specified criteria of sufficiency for the outcome to occur. This entails that the membership score on the outcome is consistently higher than the membership score of the causal combination. A value of 1 indicates a fuzzy set membership score of 0.5 or above and 0 a score below 0.5. The *number* column gives you the number of cases that exhibit the configuration listed. Raw Consistency means that the membership score on the outcome is consistently higher than the membership score of the causal combination, weighted by the relevance of each case. The membership score of a causal combination is the minimum fuzzy score in each of the conditions. Consistency scores of less than 0.75 or even 0.8 mean that there is considerable inconsistency. Ideally, scores should be above 0.9. *Raw consistency* is the degree to which *x* is a consistent subset of *y*, also called "inclusion."

[40] In the truth table analysis, if the truth table with the "remainder" rows (combinations lacking good instances) set to "don't care" then this is called parsimonious solution (which allows the incorporation of remainders into the solution) It is a reduction in complexity requiring the incorporation of simplifying assumptions that entail "difficult" counterfactuals. The complex solution (with remainders set to "false"), and the parsimonious solution (with remainders set to "don't care"). **I**ntermediate solutions use only a subset of the simplifying assumptions that are used in the most parsimonious solution, therefore intermediate solution is preferred over parsimonious solutions

[41] Raw coverage refers to the size of the overlap between the size of the casual combination set and the outcome set relative to the outcome set (Ragin, 2006:301)

[42] Unique coverage controls for overlapping explanations by partitioning the raw coverage

[43] Consistency of partial casual path

For effective R&I policy outcome, configurational solution patterns are:

Parliamentary Committee' Resources AND Societal Consultation AND Informal Inter-ministerial coordination AND
(RIASC **OR** MCRIPP)
(Consistency: 0.91, Coverage 0.76, *10 Strong Cases*)

For the absence of effective R&I policy, the solution below shows that absence of RIA with sustainability checks (RIASC) is common in both configurations. Absence of societal consultation (SPEC) leads to ineffective outcome even if it is coupled with presence of Parliamentary committee' resources (PACR). Interesting is the case of Latvia where presence of societal consultation (SPEC) and informal inter-ministerial coordination (CIIC) are not enough to bring about effective R&I policy when coupled with the lack of RIA with sustainability checks (RIASC), media attention (MCRIPP) and Parliamentary committee' resources (PACR). Approximately %68 of the cases is explained. Explained cases are mainly of Southern Europe.

Table 8 – Sufficient combinations of conditions for ineffective R&I Policy

INTERMEDIATE SOLUTION	Raw Coverage[44]	Unique Coverage[45]	Consistency[46]
ABSENCE OF SPEC AND **ABSENCE OF RIASC** AND **PRESENCE OF PACR**	0.576235	0.382963	0.976942
PRESENCE OF SPEC AND **PRESENCE OF CIIC** AND **ABSSENCE OF MCRIPP** AND **ABSENCE OF PACR A**ND **ABSSENCE OF RIASC**	0.302076	0.108805	0.981395
Solution coverage: (joint importance of all causal paths)	0.685039		
Solution consistency:	0.972561		
Cases with greater than 0.5 membership in pressure combinations (term 1)	Italy (0.73,0.73), Slovenia (0.73,0.73), Croatia (0.68,0.88), Greece (0.68,0.88), Portugal (0.68,0.73), Romania (0.68,0.88)		
Cases with greater than 0.5 membership in pressure combinations (term 2)	Latvia (0.82,0.88)		

"*":AND, presence of both conditions, +: presence of either condition or of both conditions, overall consistency cutoff: 0.897822, calculation with fsQCA 2.0 software (www.fsqca.com)

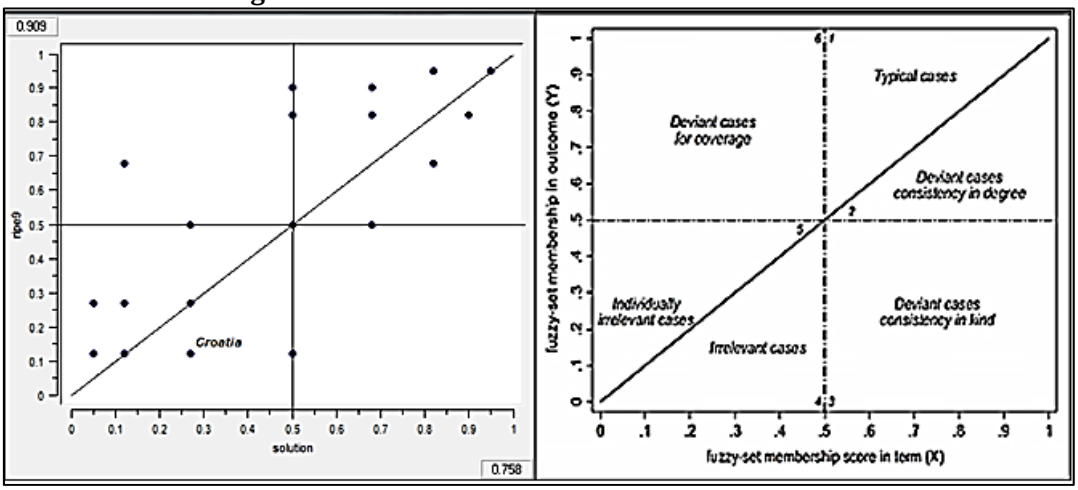
Absence of Regulatory Impact Assessment with Sustainability Checks AND
(ABSENCE OF SPEC AND PRESENCE OF PACR
OR
PRESENCE OF SPEC AND PRESENCE OF CIIC AND ABSENCE OF PACR AND ABSSENCE OF MCRIPP)
(Consistency: 0.97, Coverage: 0.68, *7 Strong Cases*)

[44] Raw coverage refers to the size of the overlap between the size of the casual combination set and the outcome set relative to the outcome set (Ragin, 2006:301)
[45] Unique coverage controls for overlapping explanations by partitioning the raw coverage
[46] Consistency of partial casual path/solution term

v. Assessment of the robustness and quality of the results

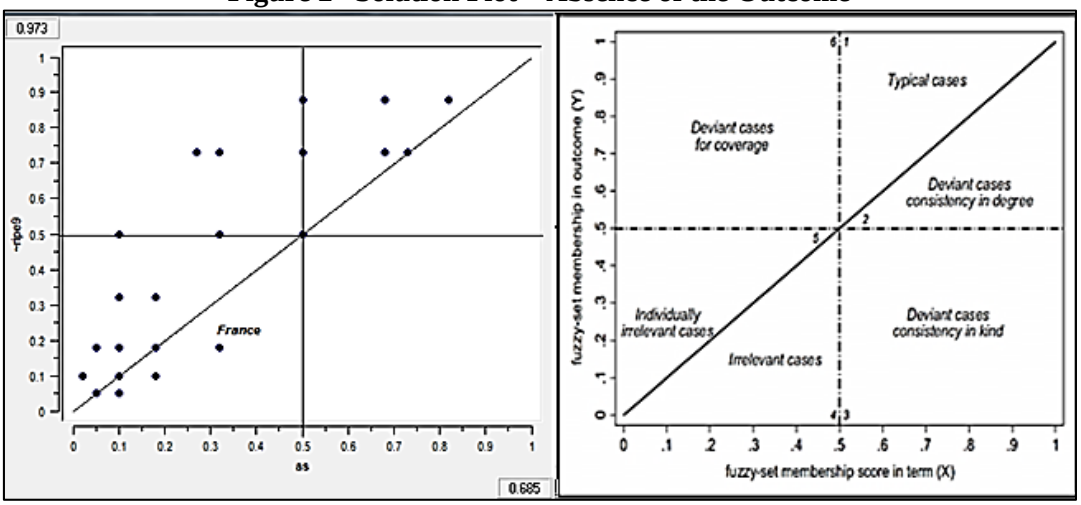
The explanatory capacity of fs/QCA models requires verification with visualisation on X-Y plots (Schneider and Grofman, 2006). If $y < 0.5$ (outcome) and $x > 0.5$ (solution), this situation signals a contradiction that falsifies the entire model (Zone 3 – right bottom square- of Figure 1 and 2 below). These are called deviant cases, consistency in kind, which are not observed in any of our solutions.

Figure 1– Solution Plot – Presence of the Outcome



Although, we do have irrelevant cases (Zone 4) and deviant cases, these are of consistency in degree (consistency outliers) (Zone 2) and this situation does not invalidate either the model or the solutions, on the contrary calls for more sophisticated qualitative analysis such as process tracing. Despite these outliers, our approach proves being able to generate reliable configurational recipes for R&I policy effectiveness, especially for explaining the absence or low values of R&I policy effectiveness, with similar consistency, coverage scores and outlier conditions in Damonte (2014) which assess environmental performance in EU-15 by fs/QCA.

Figure 2– Solution Plot – Absence of the Outcome



4. Discussion of the results

In this section we state and discuss the main findings. In the ordered logit analysis of the (separate) influence of our five explanatory variables of proximate governance, societal consultation is revealed to have the greatest effect on effective R&I innovation policy (our dependent variable), followed by parliamentary committees' resources, complementary informal inter-ministerial coordination, regulatory impact assessment with sustainability checks, and media attention. The order of importance is quite interesting, by questioning the actual power of executive ministerial personnel which appears to be conditioned by the political (political, legislative actors decisions), and by questioning the power of political actors which appears to be conditioned by societal demands (which is dispersed at societal level, of different social, economic, and environmental groups). The contribution of regulatory impact assessment with sustainability checks is relatively small (of the influence variables it has the smallest significant influence).

Interaction effects of proximate political governance conditions are studied with the help of configurational set-theoretic analysis for complementary informal coordination variant. Although each variable are statistically significant, multi-way interactions may be required to be able to bring about effective R&I policy. Parliamentary committee' resources (PACR), societal consultation (SPEC), informal inter-ministerial coordination (CIIC) form the core pattern which could either be complemented with RIA with sustainability checks (RIASC) or media attention (MCRIPP) in leading to effective R&I Policy, observed mainly in Northern and Western European Member States (e.g. Belgium, Denmark, France, Germany, The Netherlands, Sweden, Finland). This situation reveals as an interesting finding that impact of *Media Attention* and *Regulatory Impact Assessment with Sustainability Checks* is set-theoretically substitutable, functionally equivalent, meaning that they are connected to the solution configuration with a logical OR. This finding can be interpreted as saying that governments are more likely to formulate effective R&I policy either under presence of high *Media Attention* (publicity, electorate pressures) or with rigorous use of RIA with sustainability checks (recognition of presence of economic, social and environmental pressures), therefore default electorate pressures and recognition of societal pressures functionally converge. Set-theoretic analysis is also used to investigate the conditions for ineffective R&I policies. It is found that a *low values or absence of Regulatory Impact Assessment with Sustainability Checks* is the common trait between the cases which are mainly Southern European Member States (e.g. Italy, Slovenia, Croatia, Greece, Portugal, and Romania). The main pattern leading to ineffective R&I policy is also due to lack of societal consultation openness from the government side even if political opposition is present. This situation, being in line with the results of econometric analyses, provides insights for the need of further openness, democratisation in socio-technical and socio-political systems in these countries.

Both types of analyses of effective R&I innovation policy are based on a model of proximate governance. In an attempt to investigate the influence of distal variables such as property rights and culture, we did the following analyses: For six World Governance Indicators representing distal variables (Rule of Law, Control of Corruption, Political Stability and Absence of Violence, Regulatory Quality, Voice and Accountability, and Government Effectiveness) we investigated the correlations with proximate variables and indices of proximate governance. Of the variables, Control of Corruption and Regulatory Quality are the ones that are most strongly correlated with proximate governance. The influence of Regulatory Quality is as expected. The strong correlation of Control of Corruption is striking, but in the absence of further evidence of a causal link we don't want to draw conclusions on this. When investigating the correlation between distal variables and the proximate variables, we learned that Societal Consultation is the most highly correlated variable among the set of proximate political governance determinants with the distal variables provided by Democracy Barometer and World Governance Indicators of the World Bank (See Appendix Table A2 Column 9). This suggests that the influence of distal variables is *through* Societal Consultation or works *in combination with* the degree of Societal Consultation. Whether the correlation is causal cannot be determined with certainty, but we think it is worthwhile to mention the strong correlation with Societal Consultation.

5. Concluding remarks and avenues of future research

We analysed the influence of five variables of proximate political governance on the effectiveness of R&I policy: Media publicity of governmental decisions in the field of R&I, regulatory impact assessment extended to sustainability checks, resources of parliamentary committees, complementary informal inter-ministerial coordination between layers of government, and openness of governments to societal actor groups through societal consultation. Our findings offer pointers for R&I policy design, such as including a process-oriented societal consultation, enhancing parliamentary committee resources for R&I policy surveillance, triggering media's R&I policy attention as an integral part to R&I policy design at national level. Our results may be used to evaluate existing governance structures and help policy makers determine ways to improve the governance system for effective research and innovation policy (something which cannot be determined on the basis of our analysis alone).

Further research could concentrate on comparative case studies of specific Member States, innovation programmes or public projects, and especially their stories of success and failure with respect to evaluating *media/public attention, parliamentary committee debates about them, the degrees to which the varieties (formal, informal, communicative) of administrative coordination performed at decision-making level, and whether sophisticated RIAs are used before or after designing these programmes or public projects*. Another important topic for future research is the role of policy entrepreneurs in design and implementation and in bringing about effective R&I policy. In the absence of national comparative data, we could not analyse the role of policy entrepreneurs statistically.

At the EU-level, further research could be conducted on pan-European societal consultation[47] and policy entrepreneurship networks, European-level initiatives in enhancing European R&I-related coverage in the national media[48], European smart regulation agenda[49] (tools such as impact assessment, the standard cost model, and ex-post evaluation of regulatory regimes at national level which generates capacity for further coordination across policy problems at international level, European services in providing information resources[50] for the use of national-level parliamentary committees, and the Europeanisation of the mind-set of ministerial personnel at the national level[51]. Research about such further specialised job creation possibilities in media, in parliamentary committees' support services in relation to the field of R&I could also be a stimulating extension for R&I policy that could create jobs external to the socio-technical system, in the co-evolving socio-political system.

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[47] Please see EU-level consultations in the field of R&I, Source:http://ec.europa.eu/research/consultations/list_en.cfm#open

[48] Please see European Parliament Resolution of 7 September 2010 on "Journalism and New Media – Creating a public sphere in Europe' Source: http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+TA+P7-TA-2010-0307+0+DOC+PDF+V0//EN

[49] Endorsed by the European Commission, 8 October 2010 Source: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52010DC0543&from=EN

[50] European Centre for Parliamentary Research and Documentation (ECPRD) is a network of documentation and research services that cooperate closely to facilitate access to information (including national and European databases) and coordinating research so as to avoid duplication. Source: https://ecprd.secure.europarl.europa.eu/ecprd/pub/about.do

[51] Please see Schout and Bastmeijer (2003), The Next Phase in the Europeanisation of National Ministries: Preparing EU Dialogues, Source: http://aei.pitt.edu/818/1/scop2003_1_2.pdf

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APPENDIX

Table A1 – The PPG Model and Data

The Model & Data		DEPENDENT VARIABLE/ OUTCOME	INF. VAR1	INF. VAR2	INF. VAR3	INF. VAR4	Inter-ministerial Coordination		
							INF. VAR5.1 Formal	INF. VAR5.2 Informal	INF. VAR 5.3 Communica-tive
No	**Member States**	**RIPE OUTCOME**	**RIASC**	**PARC**	**MCRIPP**	**SPEC**	**ISLM**	**CIIC**	**VHPC**
1	**Austria**	**5**	8	6	19	8	3	6	5
2	**Belgium**	**6**	1	9	146	7	10	9	5
3	**Bulgaria**	**3**	3	4	7	5	6	5	4
4	**Croatia**	**3**	4	6	6	4	4	4	4
5	**Cyprus**	**4**	3	3	30	5	3	4	2
6	**Czech Rep.**	**5**	6	9	30	5	6	7	4
7	**Denmark**	**7**	9	8	58	9	9	8	8
8	**Estonia**	**7**	5	8	23	8	8	7	5
9	**Finland**	**9**	9	9	25	10	9	10	9
10	**France**	**7**	3	7	177	6	9	8	7
11	**Germany**	**8**	8	9	296	7	7	6	6
12	**Greece**	**3**	1	6	94	2	7	6	2
13	**Hungary**	**4**	2	5	9	2	10	10	10
14	**Ireland**	**5**	4	5	51	4	9	8	8
15	**Italy**	**4**	4	8	74	4	8	8	5
16	**Latvia**	**3**	2	2	8	7	8	7	8
17	**Lithuania**	**7**	6	9	24	7	7	7	6
18	**Luxembourg**	**6**	3	8	8	8	8	10	8
19	**Malta**	**4**	3	3	2	5	3	4	4
20	**Netherlands**	**8**	7	6	38	9	8	7	9
21	**Poland**	**6**	7	9	20	7	8	7	7
22	**Portugal**	**4**	3	6	25	4	7	4	7
23	**Romania**	**3**	3	6	4	3	5	3	4
24	**Slovakia**	**4**	3	6	3	7	4	7	6
25	**Slovenia**	**4**	2	9	7	4	3	7	4
26	**Spain**	**3**	3	5	71	5	7	7	6
27	**Sweden**	**9**	7	9	34	8	7	8	9
28	**UK**	**8**	10	6	607	5	9	9	8

Data Source: Bertelsmann Stiftung, http://www.sgi-network.org/2014/ and Lexis Nexis Academic http://academic.lexisnexis.eu/

Table A2 – Correlation Table

TYPE	VAR	ISLM	CIIC	VHPC	RIASC	PACR	MA	MRI	LMRI	*SPEC*	PRIGHT	PETITIO	DEMO	ROL	COC	PSAV	REGQ	VAA	GOE
Proximate	**ISLM**	1																	
	CIIC	**0.7966***	1																
	VHPC	**0.6967***	**0.6913***	1															
	RIASC	0.1205	0.1544	0.3558	1														
	PACR	0.1891	0.3652	0.1105	**0.3846***	1													
	MA	0.1835	0.3685	0.3107	**0.5439***	0.2861	1												
	MCRIPP	**0.5337***	**0.3839***	0.2205	0.2707	0.2708	0.2503	1											
	Log MCRIPP	**0.5337***	**0.3839***	0.2205	0.2707	0.2708	0.2503	**1.0000***	1										
Boundary	**SPEC**	0.2154	0.3295	**0.4493***	**0.5461***	**0.3833***	**0.6159***	0.0871	0.0871	*1*									
Distal	**PRIGHT**	0.366	**0.4442***	**0.5408***	**0.5249***	0.2422	**0.6868***	**0.4664***	**0.4664***	***0.6063****	1								
	PETITIO	0.3512	**0.5121***	**0.4145***	**0.4984***	0.3142	**0.4494***	**0.5392***	**0.5392***	***0.4555****	**0.6448***	1							
	DEMO	0.0775	0.0437	0.0172	-0.1213	-0.1752	0.202	**0.4236***	**0.4236***	*0.0217*	0.2925	**0.4833***	1						
	ROL	0.1813	0.2507	0.1518	**0.4868***	**0.4061***	0.2707	**0.4458***	**0.4458***	***0.4230****	**0.5097***	**0.4859***	0.0246	1					
	COC	**0.4419***	**0.5355***	**0.6206***	**0.4840***	0.3542	**0.6140***	**0.4685***	**0.4685***	***0.6301****	**0.9444***	**0.7178***	0.2839	**0.5281***	1				
	PSAV	0.0056	0.2763	0.3626	**0.4700***	**0.4493***	**0.3924***	-0.1057	-0.1057	***0.5710****	**0.5623***	**0.4107***	-0.1819	**0.4122***	**0.5712***	1			
	REGQ	**0.3778***	**0.5339***	**0.5714***	**0.5638***	0.2093	**0.7526***	0.3302	0.3302	***0.6978****	**0.9126***	**0.6798***	0.2554	**0.4942***	**0.8716***	**0.5829***	1		
	VAA	**0.4605***	**0.5890***	**0.6580***	**0.3983***	0.2629	**0.5741***	0.3604	0.3604	***0.5591****	**0.9195***	**0.6297***	0.2278	**0.4945***	**0.9229***	**0.6284***	**0.8696***	1	
	GOE	0.2781	**0.4356***	**0.4653***	**0.4384***	0.2564	**0.6692***	0.373	0.373	***0.6979****	**0.9328***	**0.6851***	0.2923	**0.5202***	**0.9396***	**0.6163***	**0.8987***	**0.8749***	1

*All 5% level correlations are tested with respect to collinearity diagnosis in Table A7. No individual VIF value is above 10 or tolerance below 0.1.- No condition number above 15 or 30 for the selected system of variables. SGI (2011-2013) ISLM: Inclusion of Sectorial Line Ministries; CIIC: Complementary Informal Inter-ministerial Coordination ; VHPC: Policy Communication ; RIASC: RIA with Sustainability Checks; PACR : Parliamentary Committees' Resources; MA: Media Attention to governmental decisions (generic); SPEC: Societal Consultation , Lexis Nexis (2011-2013) MCRIPP Media Attention/Coverage of R&I Policy and Politics, Democracy Barometer (2011), PRIGHT: Property rights , PETITIO: Signed Petitions , DEMO: Attended demonstrations, World Bank (2011) ROL: Rule of Law , COC: Control of Corruption PSAV: Political stability and Absence of Violence REGQ: Regulatory Quality VAA: Voice and Accountability, GOE: Government Effectiveness

STATA Outputs

Table A3- Descriptive Statistics – Dependent Variable

```
. tabulate rippe
```

rippe	Freq.	Percent	Cum.
3	6	21.43	21.43
4	7	25.00	46.43
5	3	10.71	57.14
6	3	10.71	67.86
7	4	14.29	82.14
8	3	10.71	92.86
9	2	7.14	100.00
Total	28	100.00	

ORDINAL DEPENDENT VARIABLE

Partly/ Negative	Partly/ Stable	Partly/ Positive	Largely/ Negative	Largely/ Stable	Largely/ Positive	Effective/ Stable
3	**4**	**5**	**6**	**7**	**8**	**9**

Table A4- Skewness/Kurtosis tests for Normality:

```
. sktest riasc pacr  spec ciic mcripp log_mcripp

                    Skewness/Kurtosis tests for Normality
                                                              ------- joint ------
    Variable |   Obs   Pr(Skewness)   Pr(Kurtosis)  adj chi2(2)     Prob>chi2
-------------+-------------------------------------------------------------------
       riasc |    28        0.1618         0.2318         3.71          0.1567
        pacr |    28        0.2380         0.4868         2.05          0.3596
        spec |    28        0.9562         0.2944         1.18          0.5539
        ciic |    28        0.5017         0.7117         0.61          0.7356
     mcripp |    28        0.0000         0.0000        31.58          0.0000
  log_mcripp |    28        0.5376         0.9762         0.39          0.8230
```

For each variable sktest presents a test for normality based on skewness and another based on kurtosis and then combines the two tests into an overall test statistic. Media attention seems skewed but log of media attention is not. Using log transformed variable, we obtained similar results.

Table A5- Correlations (Spearman for ordinal variables)

```
. spearman riasc pacr  spec ciic
(obs=28)
```

	riasc	pacr	spec	ciic
riasc	1.0000			
pacr	0.3846	1.0000		
spec	0.5461	0.3833	1.0000	
ciic	0.1544	0.3652	0.3295	1.0000

Table A6- Collinearity Diagnostics for system of variables

```
. collin riasc pacr  spec ciic mcripp
(obs=28)

  Collinearity Diagnostics

                       SQRT                  R-
  Variable      VIF     VIF    Tolerance    Squared
----------------------------------------------------
     riasc      2.31    1.52    0.4321      0.5679
      pacr      1.41    1.19    0.7073      0.2927
      spec      2.06    1.43    0.4864      0.5136
      ciic      1.47    1.21    0.6808      0.3192
   mcripp       1.54    1.24    0.6477      0.3523
----------------------------------------------------
  Mean VIF      1.76

                         Cond
        Eigenval         Index
---------------------------------
    1     5.0255          1.0000
    2     0.7022          2.6752
    3     0.1507          5.7738
    4     0.0549          9.5674
    5     0.0365         11.7271
    6     0.0302         12.9093
---------------------------------
 Condition Number         12.9093
 Eigenvalues & Cond Index computed from scaled raw sscp (w/ intercept)
 Det(correlation matrix)    0.2651
```

No individual VIF value is above 10 or tolerance below 0.1 - No condition number above 15 or 30. Diagnostics also applies to VHPC and ISLM.

Table A7- Measures of fit (ordered logit)

```
. fitstat

Measures of Fit for ologit of RIPE

Log-Lik Intercept Only:      -52.111     Log-Lik Full Model:          -31.497
D(17):                        62.995     LR(5):                        41.227
                                         Prob > LR:                     0.000
McFadden's R2:                 0.396     McFadden's Adj R2:             0.184
Maximum Likelihood R2:         0.771     Cragg & Uhler's R2:            0.790
McKelvey and Zavoina's R2:     0.811
Variance of y*:               17.389     Variance of error:             3.290
Count R2:                      0.464     Adj Count R2:                  0.286
AIC:                           3.036     AIC*n:                        84.995
BIC:                           6.347     BIC':                        -24.566
```

Table A8.a– Odds Ratios

```
. ologit rippe riasc pacr  mcripp spec ciic, r or

Iteration 0:   log pseudolikelihood = -52.110816
Iteration 1:   log pseudolikelihood = -35.409648
Iteration 2:   log pseudolikelihood = -32.023925
Iteration 3:   log pseudolikelihood = -31.504155
Iteration 4:   log pseudolikelihood = -31.497293
Iteration 5:   log pseudolikelihood = -31.497286
Iteration 6:   log pseudolikelihood = -31.497286

Ordered logistic regression                     Number of obs   =         28
                                                Wald chi2(5)    =      49.37
                                                Prob > chi2     =     0.0000
Log pseudolikelihood = -31.497286               Pseudo R2       =     0.3956

------------------------------------------------------------------------------
             |               Robust
      rippe  | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       riasc |   1.518934   .2456862     2.58   0.010     1.106262    2.085547
        pacr |   1.654201   .4255703     1.96   0.050     .9990861    2.738886
     mcripp  |   1.006797    .003272     2.08   0.037     1.000404     1.01323
        spec |   2.190962   .5803537     2.96   0.003     1.303659    3.682186
        ciic |   1.534624   .3629884     1.81   0.070     .9653068    2.439714
-------------+----------------------------------------------------------------
       /cut1 |   9.446183   2.106975                      5.316587    13.57578
       /cut2 |   12.65931   2.675607                      7.415217     17.9034
       /cut3 |   14.42131   2.908511                      8.720729    20.12188
       /cut4 |   15.69709    3.00941                      9.798759    21.59543
       /cut5 |   17.50602   2.869405                      11.88209    23.12995
       /cut6 |   19.45149   3.116698                      13.34287    25.56011
------------------------------------------------------------------------------
```

The interpretation would be that for a one unit change in the predictor variable, the odds for cases in a group that is greater than *k* versus less than or equal to *k* are the proportional odds times larger.

Table A8.b– Odds Ratios (log Media)

```
. ologit RIPE CIIC RIASC SPEC PARC L_MCRIPP, r or

Iteration 0:   log pseudolikelihood = -52.110816
Iteration 1:   log pseudolikelihood =  -34.92207
Iteration 2:   log pseudolikelihood =  -31.39919
Iteration 3:   log pseudolikelihood = -31.170561
Iteration 4:   log pseudolikelihood = -31.169092
Iteration 5:   log pseudolikelihood = -31.169092

Ordered logistic regression                     Number of obs   =         28
                                                Wald chi2(5)    =      25.63
                                                Prob > chi2     =     0.0001
Log pseudolikelihood = -31.169092               Pseudo R2       =     0.4019

------------------------------------------------------------------------------
             |               Robust
        RIPE | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        CIIC |   1.629388   .3512451     2.26   0.024     1.067903     2.48609
       RIASC |   1.640184   .2322004     3.50   0.000     1.242763    2.164696
        SPEC |   2.112459    .579523     2.73   0.006     1.233881    3.616624
        PARC |   1.480833   .3528005     1.65   0.099     .9283505    2.362111
    L_MCRIPP |   2.000369   .7739043     1.79   0.073     .9371226    4.269958
-------------+----------------------------------------------------------------
       /cut1 |   10.89174   2.944635                      5.120359    16.66311
       /cut2 |   14.25008   3.514852                      7.361099    21.13907
       /cut3 |   16.08526   4.029069                      8.188429    23.98209
       /cut4 |   17.35838   4.181883                      9.162043    25.55472
       /cut5 |   19.18644   4.163054                      11.02701    27.34588
       /cut6 |   21.06775   4.502101                      12.24379    29.89171
------------------------------------------------------------------------------
```

Table A9.a- Marginal effects of each independent variable

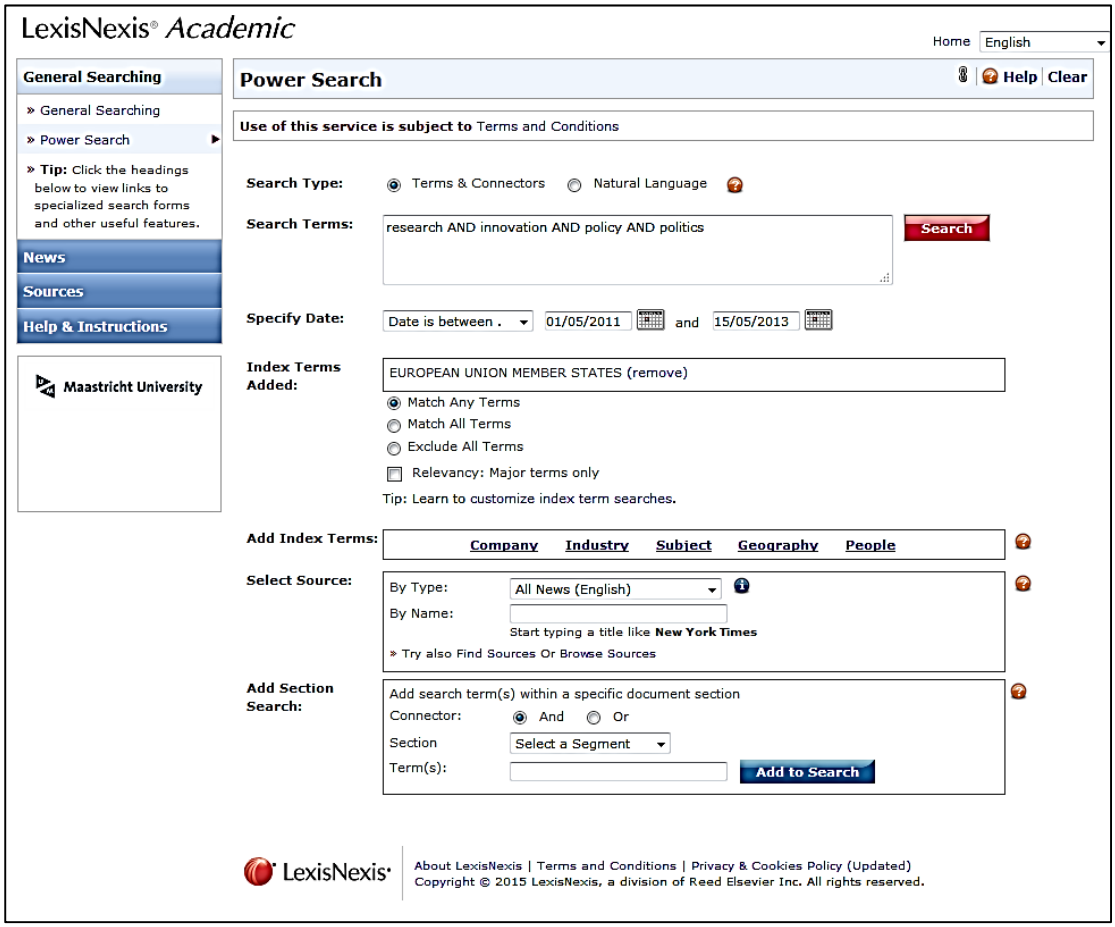
```
. prchange

ologit: Changes in Probabilities for rippe

riasc
            Avg|Chg|          3          4          5          6          7          8          9
Min->Max   .19695735  -.08500233  -.56640947  -.03793892    .2442631   .32379335   .10183153   .01946276
   -+1/2   .02690469  -.00853441  -.08563197   .01666361   .04536884   .02603232    .0052067   .00089496
  -+sd/2   .06895387  -.02301918  -.21831937   .04076323   .11513705   .06895622   .01405682   .00242523
MargEfct   .02697428  -.00848013  -.08592986    .0168426   .04555907    .025947   .00517276   .00088856

pacr
            Avg|Chg|          3          4          5          6          7          8          9
Min->Max   .20183428  -.17318048   -.5332395   .22022006   .26498583   .17601523   .03846175   .00673711
   -+1/2   .03235796  -.01030561  -.10294724   .01996824   .05452475   .03139106   .00628773   .00108108
  -+sd/2   .06691934  -.02226039  -.21195731   .03969032   .11182117   .06676917   .01359255    .0023445
MargEfct   .03247934   -.0102108  -.10346688   .02027993   .05485701    .0312424   .00622844    .0010699

mcripp
            Avg|Chg|          3          4          5          6          7          8          9
Min->Max   .21527073  -.03141224  -.40589036  -.31614493   .02997087   .36732106    .2814148   .07474082
   -+1/2   .00043711  -.00013742  -.00139245   .00027293   .00073826   .00042047   .00008382    .0000144
  -+sd/2   .05353755  -.01744563  -.16993581   .03235817   .08982646   .05271443   .01064849   .00183388
MargEfct   .00043711  -.00013742  -.00139246   .00027293   .00073827   .00042046   .00008382    .0000144

spec
            Avg|Chg|          3          4          5          6          7          8          9
Min->Max   .25630825  -.30862989  -.58844897   .02114241   .18462873   .41962106   .22100061   .05068606
   -+1/2   .05015652  -.01627148  -.15927635   .03043762   .08422555   .04924389   .00993101   .00170976
  -+sd/2   .10357743  -.03744565  -.32507536   .05686048   .16989622   .10888595   .02290209   .00397627
MargEfct   .05061382  -.01591189  -.16123648   .03160301   .08548582   .04868625   .00970602   .00166726

ciic
            Avg|Chg|          3          4          5          6          7          8          9
Min->Max   .17538067  -.09521433  -.51861802   .11920545   .25504905   .18889401    .0430737   .00761014
   -+1/2    .0275626    -.008747  -.08772209   .01706418   .04647452   .02667665   .00533644   .00091728
  -+sd/2   .05231584   -.0170196  -.16608585   .03166705   .08780441   .05145699   .01038814   .00178883
MargEfct   .02763744  -.00868861  -.08804244   .01725668   .04667914   .02658491   .00529993    .0009104

               3          4          5          6          7          8          9
Pr(y|x)  .02071612   .32390171   .40922478   .16260274   .06883762    .0125868   .00213022

         riasc     pacr    mcripp      spec      ciic
   x=  4.60714  6.64286  67.7143   5.89286   6.89286
sd_x=  2.60113  2.09434  123.757   2.13158   1.91174
```

Table A9.b- Marginal effects of each independent variable (log Media)

```
. prchange

ologit: Changes in Probabilities for RIPE

CIIC
            Avg|Chg|          3          4          5          6          7          8          9
Min->Max   .19230585   -.1026317  -.57043879   .13079801   .27069245   .21361574   .04864076    .0093235
   -+1/2   .03113826  -.00847442  -.10050949   .02064386   .05212088   .02950301   .00566753   .00104861
  -+sd/2   .05899328  -.01658359  -.18989286   .03800875   .09822847   .05708886   .01109336   .00205703
MargEfct   .03124471  -.00839949  -.10095701    .0209391   .05239701   .02936506   .00561693    .0010384

RIASC
            Avg|Chg|          3          4          5          6          7          8          9
Min->Max   .21948872  -.09477358  -.62415214  -.04928479    .2256307   .37681146   .13625024   .02951814
   -+1/2   .03155655  -.00859113   -.1018568   .02091503   .0528183   .02990589    .0057456   .00106308
  -+sd/2   .08045109  -.02353054  -.25804827   .05003169   .1330107   .07986361   .01574502   .00292779
MargEfct   .03166737  -.00851311   -.1023227   .02122235   .05310581   .02976229   .00569292   .00105245

SPEC
            Avg|Chg|          3          4          5          6          7          8          9
Min->Max   .25165704  -.24593864  -.63486101   .02698144   .20557002   .41681136   .18749726   .04393954
   -+1/2   .04748073  -.01313668  -.15304588   .03102508   .07926831   .04547506   .00878659   .00162751
  -+sd/2   .09841103  -.03007758  -.31436104   .05881819   .16129233    .1004396   .02013259   .00375589
MargEfct   .04786203   -.0128667   -.1546504   .03207543   .08026405   .04498269   .00860427   .00159067

PARC
            Avg|Chg|          3          4          5          6          7          8          9
Min->Max   .16898532  -.09233908  -.49910954   .19929631   .22569921   .13455626   .02688153   .00501531
   -+1/2   .02507101  -.00679366  -.08095488   .01668489   .04199323   .02368671   .00454333   .00084037
  -+sd/2   .05211704  -.01450576  -.16790387   .03387535   .08692352   .05011012   .00970273   .00179794
MargEfct   .02512642  -.00675471  -.08118777   .01683883   .04213671   .02361484   .00451704   .00083506

L_MCRIPP
            Avg|Chg|          3          4          5          6          7          8          9
Min->Max   .19929912  -.09346531  -.60408163   .01298937   .26256815   .31363257   .09009757   .01825926
   -+1/2    .0440686  -.01214368  -.14209643   .02889791   .07361963   .04209631   .00812218   .00150403
  -+sd/2   .06079479  -.01713828  -.19564347    .0390715    .1011795   .05893981   .01146465   .00212629
MargEfct    .0443727  -.01192867  -.14337578     .029737   .07441249   .04170327   .00797698   .00147471

               3          4          5          6          7          8          9
Pr(y|x)  .01751152   .32123536   .42372712   .15730998   .06639264   .01169184   .00213153

          CIIC      RIASC       SPEC       PARC   L_MCRIPP
   x=   6.89286    4.60714    5.89286    6.64286    3.25845
sd_x=   1.91174    2.60113    2.13158    2.09434    1.38834
```

Obtaining marginal effects of each independent variable, holding the others constant at their mean reveals that marginal effect of openness of government to external policy entrepreneurs is greater than other influence variables

Table A12 - Media Coverage in Research & Innovation Policy and Politics / Lexis Nexis 1 May 2011- 15 May 2013



Source: http://academic.lexisnexis.eu/

APPENDIX - Supplementary File – Component A / Showcases for Theoretically-informed Selected Variables

Box SF1.1 – Cases *of Inclusion of Sectorial Line Ministries* (ISLM)

Case – Excerpt: "Denmark, The Netherlands, Hungary" Source: SGI, 2011-2013 http://www.sgi-network.org/2014/Governance/Executive_Capacity/Interministerial_Coordination/Line_Ministries
Denmark: "*Major issues and strategic considerations are dealt with in the government coordination committee (regeringens koordineringsudvalg) involving the prime minister and other key ministers.* ***The Ministry of Finance also plays an important role whenever financial resources are involved****. No minister can go to the finance committee of the People's Assembly (Folketing) without prior agreement from the Ministry of Finance. Apart from coordinating the preparation of next year's finances,* ***the Ministry of Finance is also involved in formulating general economic policy and offering economic and administrative assessments of the consequences of proposed laws****.*[52]*"* (SGI, 2014) **The Netherlands**: *"Generally, the initiative by a line ministry to start drafting new legislation or a white paper is rooted in the government policy accord, EU policy coordination and subsequent Council of Ministers decisions to allocate drafting to one or two line ministries.* ***With complex problems, draft legislation may involve considerable jockeying for position among the various line ministries.***[53]*''* (SGI, 2014) **Hungary:** *"To ease central control,* ***the number of line ministries has been limited to seven, with portfolios for foreign affairs, defense, interior, national economy, national development, human (earlier national) resources (EMMI) and rural development (VM).*** *The small number of ministries has complicated their representation on the various EU councils, and created additional confusion with regard to coordination efforts during the Hungarian EU presidency in 2011. ".* (SGI, 2014)

Box SF1.2 – Case of *Complementary Informal Inter-ministerial Coordination* (CIIC)

Case – Excerpt: "Finland, The Netherlands, Hungary" Source: SGI, 2011-2013 http://www.sgi-network.org/2014/Governance/Executive_Capacity/Interministerial_Coordination/Informal_Coordination
Finland: *"Inter-sectoral coordination has generally been perceived as an important issue, but rather few institutional mechanisms have in fact been introduced. One of these is the so-called iltakoulu, or evening session, which is an unofficial negotiation session of the Cabinet.* ***To a considerable extent, though, coordination proceeds effectively through informal mechanisms.*** *The recent large-scale policy programs enhance inter-sectoral divisions in policymaking and administration. Additionally, Finnish EU membership has of course brought forth the need for increased inter-ministerial coordination. Recent research in Finland has only marginally focused on informal mechanisms."* (SGI, 2014) **The Netherlands**: *"Under the present conditions in which civil servants are subject to increasing parliamentary and media scrutiny, and in which gaps in trust and loyalty between the political leadership and the bureaucracy staff are growing,* ***informal coordination as well as personal chemistry among civil servants is what keeps things running.*** *Regarding inter-ministerial coordination, informal contacts between the senior staff (raadsadviseurs) in the prime ministers Council of Ministers and senior officers working for ministerial leadership are absolutely crucial. Nonetheless, such bureaucratic coordination is undermined by insufficient or absent informal political coordination"*[54]*.* **Hungary:** *"The strong formal role of Prime Minister and his Chancellery has been complemented by informal coordination mechanisms. There are about 150 top decision-makers within the Hungarian government that are appointed directly by the prime minister. Within this group there are two circles of informality and confidence. First, Prime Minister meets his closest 20 to 30 people regularly, and many important decisions stem from these personal encounters. Second, Prime Minister from time to time convenes some officials from the larger circle to whom he gives instructions.* ***Many decisions originate from these meetings, and such decisions are processed through the system informally before any formal decision is taken.*** *These informal coordination mechanisms make rapid decisions possible. Given the pivotal role of the prime minister, however, such a process also creates a bottleneck in decision-making".* (SGI, 2014)

[52] Jørgen Grønnegård Christensen et al., Politik og forvaltning, 2007

[53] R.B. Andeweg and G.A. Irwin (2009), Governance and politics of the Netherlands. Houndmills, Basingstoke: Palgrave Macmillan.

[54] R.B. Andeweg and G.A. Irwin (2009), Governance and politics of the Netherlands. Houndmills, Basingstoke: Palgrave Macmillan, 169, 181-183, 204.

Box SF1.3 – Case of *Vertical and Horizontal Policy Communication* (VHPC)

Case – Excerpt: "Hungary, The Netherlands, Lithuania"
Source: SGI, 2011-2013
http://www.sgi-network.org/2014/Governance/Executive_Capacity/Policy_Communication/Coherent_Communication

Hungary: *"The Prime Minister's Chancellery largely coordinates and controls government communication. Ministers tend to follow the prime minister's message; and for this reason, the Chancellery has often been derided as a "chorus of parrots." Contradictory statements by individual ministers are rare. If they do occur, the statements are corrected quickly by the prime minister and his staff or aides.* ***In December 2012, for instance, an improvised statement by Prime Minister Orbán in Brussels ended a period of confusion over the government's position on university enrollment."*** (SGI, 2014)

The Netherlands*: "**The 1Logo project, for example, aims to impose a single brand and editorial policy on all websites run by the national government. Another project aims to create a single pool of government communication and information officials to be used by all departments.* ***The project also includes establishing a shared intranet (rijksportaal.nl) and joint digital news service for all officials working for the national government. Another effort toward centralized, coherent communication involves replacing departmentally run televised information campaigns with a unified, thematic approach (e.g., safety).*** *All these efforts to have government speak with "one mouth" appear to have been fairly successful."* (SGI, 2014)

Lithuania: *"Although the Butkevičius government announced that it would pursue a whole-of-government approach to public policy and management, the implications of this goal in terms of coherent communications had not been addressed at the time of writing.* ***Moreover, Prime Minister Butkevičius has himself publicly made contradictory statements on such politically important issues as tax reform or the future of nuclear power in Lithuania, probably reflecting the diversity of opinions within his party and the ruling coalition****."* (SGI, 2014)

Box SF2 – Case of *Media Attention*

Case – Excerpt: "George Osborne pledges extra £600m for science to stimulate growth",
Source: Ian Sample, December 5, 2012 Wednesday, The Guardian

"George Osborne[55] will divert £600m from savings across Whitehall into science research facilities and advanced technology projects chosen for their potential to drive financial growth….The funds amount to the single largest addition to UK research spending since the coalition came to power, and underpin the government's conviction that science and technology are key to the nation's economic recovery. ***The science minister, David Willetts***, said *"science and innovation were "fundamental" to the UK economy and that the extra money would support areas where Britain can gain a competitive advantage "This will drive growth, create the jobs of the future, and help us get ahead in the global race,"* ***Imran Khan, director of the Campaign for Science and Engineering,*** said he was "delighted" with the government's support to make the UK a high-tech nation. ***Paul Nurse, president of the Royal Society said "****The announcement today of an additional £600m of capital investment will hopefully help ensure that our world leading scientists have world leading facilities with which to work."* Nurse warned that while the chancellor had identified eight areas where the UK already has an edge, other fields of science must not be neglected. *"We must not narrow our focus too much and risk sacrificing the ideas that will create growth decades from now,"* Nurse said. **The science community** applauded the announcement, though some pointed out that Britain still faced strong competition from countries that invest more in science.

Box SF3 – Case of *RIA with Sustainability Checks*

Case – Excerpt: "Sustainability in Impact Assessments",
Source: OECD, 2012
http://www.oecd.org/gov/regulatory-policy/Sustainability%20in%20impact%20assessment%20SG-SD%282011%296-FINAL.pdf

"The consideration of sustainability issues in IA adds the perspective of intergenerational justice, international fairness and the consideration of trade-offs between social, environmental and economic aspects to the intention of designing better, more effective and efficient regulations and policies. IA has the potential to enhance the consideration of concerns of SD in

[55] the Chancellor of the Exchequer and Second Lord of the Treasury since 2010 and the Member of Parliament for Tatton since 2001, Source: OSBORNE, Rt Hon. George (Gideon Oliver). Who's Who 2015 (online Oxford University Press)

decision making, but it faces considerable challenges and difficulties as well. Integrating the long term perspective and a holistic approach covering many different impact areas to IA add considerably to the difficulties which are already inherent in evidence based policy making. However, concerns of better regulation as well as of SD are cross cutting issues of government which can mutually reinforce each other, rather than compete, because of common concerns they share. Main common concerns include:
• increased interdepartmental and interdisciplinary work;
• improving transparency and consultation;
• the coherence of policies with the priorities of governments; and
• the full consideration of long-term costs and benefits in decision-making."

Box SF4– Case of *Parliamentary Committees*

Case – Excerpt: "2nd Parliamentary Debate in Lisbon",
Source: Parliaments and Civil Society in Technology Assessment (PACITA)
http://pacita.strast.cz/en/events/2nd-parliamentary-debate-in-lisbon

"Policy-makers attending the meeting will be elected members of Parliaments, members of ministries, scientific advisors, lobbyists, etc. During the first Parliamentary Meeting held in June 2012 in Copenhagen, the policy-makers shared with the Technology Assessment community their expectations and concerns related to the mission of Technology Assessment… On April 8, 2014, the PACITA partners will organise a 2nd Parliamentary debate in Lisbon, where the project partners and other interested institutions from various spheres will participate together with parliamentarians from the PACITA partners´ countries in order to discuss current issues regarding technology assessment in Europe. Participants will discuss these questions on the basis of concrete projects and initiatives, as well as on their daily life of politicians and policy-makers. The second Parliamentary TA Debate should provide an opportunity for policy-makers from all over Europe to meet and share their experiences with respect to policy-making on science, technology and innovation." Organiser name: **Danielle Buetschi**

Box SF5 – Case of *Societal Consultation (SPEC)*

Case – Excerpt: "Denmark, The Netherlands, Latvia"
Source: SGI, 2011-2013
http://www.sgi-network.org/2014/Governance/Executive_Capacity/Societal_Consultation/Negotiating_Public_Support

Denmark: There is a long tradition of involving economic and social actors **at all stages of the policy cycle**, **even sometimes in the implementation phase**. Both formally and informally, there are good contacts between the government administration and the main interest organizations (e.g., trade unions, employers, various business organizations and NGOs), as well as heads of major companies. Interest organizations provide important information for *politicians* and *civil servants.* While corporatism has changed over the years, it still exists in Denmark[56].

The Netherlands: International references to the "polder model" as form of consensus-building testifies to the Dutch reputation for negotiating public support for public policies, sometimes as a precondition for parliamentary approval. the government consults extensively with vested interest groups in the economy and/or civil society **during policy preparation and attempts to involve them in policy implementation**. It has been a strong factor in the mode of political operation and public policymaking deployed by the Rutte I (2010 - 2012) and Rutte II (2012 - present) governments.[57]

Latvia: Consultations are perceived as formal, and in fact offer little opportunity to make an impact on the direction and quality of government policies. NGOs have voiced complaints about the quality of participation, prompting the Council of Ministers/NGO cooperation council to conduct a cross-ministry review of consultation practices during 2011 and 2012.In its public consultations, the government is rarely successful in achieving an exchange of views and information that increases the quality of government policies or induces societal actors to support them[58] (SGI, 2014)

[56] Henning Jorgensen, Consensus, Cooperation and Conflict: The Policy Making Process in Denmark, 2002.
[57] R.B. Andeweg and G.A. Irwin (2009), Governance and politics of the Netherlands. Houndmills, Basingstoke: Palgrave Macmillan, p. 169-179, 208-228.
[58] State Chancellery (2011, 2012), Reports, Available at (in Latvian): http://www.mk.gov.lv/vk/gadaparskats/, Last assessed: 20.05.2013

Supplementary File – Component B – Quantitative Discussions of interaction between distal variables and proximate political governance, and the selection of Societal Consultation variable

We constructed three proximate political governance indices with principal components analysis and equal weighting (Table SF2 a, b, c) considering statistically significant coefficients of each constituent in regression analysis (Table SF1) and checked for the correlations between these three indices and those institutional (distal) variables, namely the World Governance Indicators of World Bank (Table SF3). This correlation analysis revealed significant positive correlations (Table SF3). As expected our four-variable proximate political governance indices are relatively less correlated with "Rule of Law" and "Political stability and absence of violence" indicators of the World Bank due to their constituents. Therefore, we extended our analysis to find proxies for these broader variables in relation to R&I policy. "Rule of Law" indicator of the World Bank is easier to associate with R&I policy -we used Property Rights (for Rule of Law) Indicator as a proxy from Democracy Barometer, measuring effective guarantee of property rights in a regime. Finding proxies relating to R&I under "Political Stability and Absence of Violence" is not that straightforward. From Democracy Barometer, we used "signed petitions" relating to R&I policy for it captures a form of non-institutionalised participation and "attended demonstrations" for it captures a practice of non-institutionalised participation that could be associated with R&I considering petitions and demonstration relating to R&I in Europe as two showcases at this distal, societal level[59] . We used "media access of politicians during elections" as a measure of the extent to which political candidates and parties have fair access to the media and other means of communication, from Bertelsmann Stiftung to capture not restricted or refused access to media on grounds of different political opinions, property or other status as defined by Bertelsmann Stiftung, considering examples of the media content provided by the Royal Society and The Telegraph[60] as two examples of R&I-related opinion spectrum of political parties before elections at this distal, societal level. Incorporating our proximate political governance indices with these distal variables on *property rights, signed petitions, attended demonstrations* from Democracy Barometer, and *media access of politicians* variable from Bertelsmann Stiftung into regression analyses revealed positive statistical significance for all variables, and the sign of the attended demonstrations being negative, as expected (Table SF 5). Considering these distal variables, we think we justify inclusion our fifth variable: societal consultation of government into our proximate political governance model, as a proxy for internalisation capacity of distal conditions into proximate political governance by governmental action as boundary work.

[59] Research protests and activism Source: http://www.euroscientist.com/repeated-research-protests-streets-madrid/ http://www.euroscientist.com/southern-european-scientists-become-activists-as-recession-bites/

[60] Royal Society, Party Manifestos on R&I Source: http://blogs.royalsociety.org/in-verba/2015/04/17/what-do-the-party-manifestos-say-on-research-and-innovation/ and Telegraph *"When is the election? May 7. Who wants your vote? Conservatives, Labour, Lib Dems, Ukip, Green Party and SNP. But do you know their environment policies?"* Source: http://www.telegraph.co.uk/news/general-election-2015/11461278/Environment-Election-2015-party-policies.html

Table SF1– Regression Results: Proximate political governance, three sub-models

Dependent Variable:	Ordered Logit Model 1	Ordered Logit Model 2	Ordered Logit Model 3
Research and Innovation Policy Effectiveness	**Formal Coordination**	**Informal Coordination**	**Communicative Coordination**
Influence Variables:			
Line Ministries Inclusion to Policy Proposals (VH1)	**0.349** **-0.174**		
Informal Inter-ministerial Coordination (VH2)		**0.431** **-0.194**	
Policy Communication (VH3)			**0.525** **-0.257**
RIA extended to Sustainability Checks	**0.601***** **-0.155**	**0.611***** **-0.17**	**0.517**** **-0.227**
Parliamentary Committees' Resources	**0.472**** **-0.221**	**0.422**** **-0.207**	**0.595**** **-0.278**
Media Coverage of Government Decisions	**0.882**** **-0.305**	**0.722**** **-0.329**	**0.847**** **-0.339**
cut1	**9.139*** **	**8.751*** **	**10.13****
_cons	**-2.48**	**-2.202**	**-3.133**
cut2	**11.83*** **	**11.56*** **	**13.02*** **
_cons	**-2.639**	**-2.476**	**-3.403**
cut3	**13.17*** **	**12.79*** **	**14.30*** **
_cons	**-3.002**	**-2.758**	**-3.779**
cut4	**14.28*** **	**13.78*** **	**15.39*** **
_cons	**-3.255**	**-2.894**	**-3.846**
cut5	**16.02*** **	**15.38*** **	**17.13*** **
_cons	**-3.255**	**-2.898**	**-3.825**
cut6	**18.04*** **	**17.42*** **	**19.50*** **
_cons	**-3.354**	**-2.967**	**-4.217**
omodel: Approximate likelihood-ratio test of proportionality of odds across response categories:	**chi2(20) = 28.30 Prob > chi2 = 0.1026**	**chi2(20) = 20.08 Prob > chi2 = 0.4529**	**chi2(20) = 25.02 Prob > chi2 = 0.2007**
Member States	**28**	**28**	**28**

Standard errors in parentheses * p<0.10, ** p<0.05, *** p<0.01

Results indicate an important positive influence for each of the four variables in three different configurations. Therefore we constructed three proximate political governance indices with principal components analysis and equal weighting. We checked the correlations between our three indices and those institutional (distal) variables, namely the World Governance Indicators, which assigned significant correlations. Our indices are, as expected, relatively less correlated with "Rule of Law" and "Political stability and absence of violence". Therefore, we extended our analysis to these broader variables in relation to R&I policy.

Table SF2.a– Index Formation with PCA and Equal Weights[61]

```
. pca LineMinistries SustainabilityCheck ParliamentaryResources Media

Principal components/correlation                  Number of obs    =         28
                                                  Number of comp.  =          4
                                                  Trace            =          4
    Rotation: (unrotated = principal)             Rho              =     1.0000

    Component |   Eigenvalue   Difference        Proportion   Cumulative
--------------+------------------------------------------------------------
        Comp1 |      2.06363      1.18974            0.5159       0.5159
        Comp2 |      .873889      .238672            0.2185       0.7344
        Comp3 |      .635218      .207953            0.1588       0.8932
        Comp4 |      .427264            .            0.1068       1.0000

Principal components (eigenvectors)

    Variable |      Comp1      Comp2      Comp3      Comp4  Unexplained
-------------+--------------------------------------------------------
 LineMinist~s      0.3621     0.8794     0.2475     0.1849            0
 Sustainabi~k      0.5424    -0.4283     0.2118     0.6910            0
 Parliament~s      0.5064     0.0535    -0.8545    -0.1024            0
        Media      0.5641    -0.2008     0.4046    -0.6912            0
```

. gen PPG4_LM_PCA = 0.3621*LineMinistries +0.5424*SustainabilityCheck + 0.5064*ParliamentaryResources + 0.5641*Media

Table SF2.b– Index Formation with PCA and Equal Weights[62]

```
. pca InformalCoordination SustainabilityCheck ParliamentaryResources Media

Principal components/correlation                  Number of obs    =         28
                                                  Number of comp.  =          4
                                                  Trace            =          4
    Rotation: (unrotated = principal)             Rho              =     1.0000

    Component |   Eigenvalue   Difference        Proportion   Cumulative
--------------+------------------------------------------------------------
        Comp1 |      2.25527      1.47434            0.5638       0.5638
        Comp2 |      .780925      .158546            0.1952       0.7590
        Comp3 |       .62238      .280951            0.1556       0.9146
        Comp4 |      .341429            .            0.0854       1.0000

Principal components (eigenvectors)

    Variable |      Comp1      Comp2      Comp3      Comp4  Unexplained
-------------+--------------------------------------------------------
 InformalCo~n      0.4704     0.6876    -0.3113     0.4571            0
 Sustainabi~k      0.4867    -0.6829     0.0260     0.5441            0
 Parliament~s      0.4868     0.1928     0.8196    -0.2328            0
        Media      0.5521    -0.1538    -0.4803    -0.6639            0
```

. gen PPG4_IC_PCA = 0.4704*InformalCoordination +0.4867*SustainabilityCheck + 0.4868*ParliamentaryResources + 0.5521*Media

[61] Equal weights are calculated: . gen PPG4_LM_EW = (LineMinistries + SustainabilityCheck + ParliamentaryResources + Media)/4 . gen PPG4_IC_EW = (InformalCoordination +SustainabilityCheck + ParliamentaryResources + Media)/4 . gen PPG4_PC_EW = (PolicyCommunication +SustainabilityCheck + ParliamentaryResources + Media)/4

[62] Equal weights are calculated: . gen PPG4_LM_EW = (LineMinistries + SustainabilityCheck + ParliamentaryResources + Media)/4 . gen PPG4_IC_EW = (InformalCoordination +SustainabilityCheck + ParliamentaryResources + Media)/4 . gen PPG4_PC_EW = (PolicyCommunication +SustainabilityCheck + ParliamentaryResources + Media)/4

Table SF2.c– Index Formation with PCA and Equal Weights[63]

```
. pca   PolicyCommunication SustainabilityCheck ParliamentaryResources Media

Principal components/correlation                  Number of obs    =         28
                                                  Number of comp.  =          4
                                                  Trace            =          4
    Rotation: (unrotated = principal)             Rho              =     1.0000
```

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.17107	1.31615	0.5428	0.5428
Comp2	.854916	.323407	0.2137	0.7565
Comp3	.53151	.0890045	0.1329	0.8894
Comp4	.442505	.	0.1106	1.0000

Principal components (eigenvectors)

Variable	Comp1	Comp2	Comp3	Comp4	Unexplained
PolicyComm~n	0.4333	-0.7052	0.5597	0.0413	0
Sustainabi~k	0.5614	0.0030	-0.3765	-0.7369	0
Parliament~s	0.4321	0.7090	0.5552	0.0484	0
Media	0.5571	-0.0045	-0.4865	0.6730	0

. gen PPG4_PC_PCA = 0.4333*PolicyCommunication +0.5614*SustainabilityCheck + 0.4321*Parliam entaryResources + 0.5571*Media

[63] Equal weights are calculated: . gen PPG4_LM_EW = (LineMinistries + SustainabilityCheck + ParliamentaryResources + Media)/4 . gen PPG4_IC_EW = (InformalCoordination +SustainabilityCheck + ParliamentaryResources + Media)/4 . gen PPG4_PC_EW = (PolicyCommunication +SustainabilityCheck + ParliamentaryResources + Media)/4

Table SF3 – Correlations of our Indices with WGI indicators

Indices	**PPG4_LM_PCA**	**PPG4_IC_PCA**	**PPG4_PC_PCA**	**PPG4_LM_EW**	**PPG4_IC_EW**	**PPG4_PC_EW**	**ROL**	**COC**	**PSAV**	**REGQ**	**VAA**	**GOE**
Formal Coordinative PPG (pca)	1											
Informal Coordinative PPG (pca)	0.9759*	1										
Communicative PPG (pca)	0.9664*	0.9591*	1									
Formal Coordinative PPG (ew)	0.9943*	0.9634*	0.9498*	1								
Informal Coordinative PPG (ew)	0.9754*	0.9998*	0.9577*	0.9640*	1							
Communicative PPG (ew)	0.9662*	0.9607*	0.9979*	0.9542*	0.9601*	1						
WGI 2011												
Rule of Law	*0.5054**	*0.5063**	*0.4716**	*0.4894**	*0.5078**	*0.4625**	1					
Control of Corruption	**0.6407***	**0.6558***	**0.6952***	**0.6338***	**0.6516***	**0.6950***	**0.5034***	1				
Political Stability and Absence of Violence	*0.5077**	*0.5745**	*0.6020**	*0.4699**	*0.5725**	*0.6060**	0.3521	0.5928*	1			
Regulatory Quality	**0.6730***	**0.7000***	**0.7380***	**0.6594***	**0.6943***	**0.7265***	**0.4760***	**0.8837***	**0.6000***	1		
Voice and Accountability	**0.6133***	**0.6666***	**0.6714***	**0.6157***	**0.6657***	**0.6789***	**0.5338***	**0.8902***	**0.6610***	**0.8566***	1	
Government Effectiveness	**0.5896***	**0.6349***	**0.6404***	**0.5724***	**0.6296***	**0.6316***	**0.5059***	**0.9379***	**0.6435***	**0.8804***	**0.8865***	1

For "Rule of Law" we use Property Rights and for Political Stability and Absence of Violence we used "signed petitions", "attended demonstrations" and "media access of politicians during elections" as metric-based factors.

Table SF4 – Picking the Distal (action-oriented) Variables

Proximate	Line Ministries Informal Coordination Policy Communication	Sustainability Checks	Parliamentary Committees	Media Attention
Broader	Property Rights	Petitions	Demonstrations[64]	Electoral Politicians' Media Access
World Governance Indicators (World Bank)	*Rule of Law*	*Political Stability and Absence of Violence*		

Table SF5 – Regression results with Sub-Models (with different index creation methods, and broader/distal institutional conditions)

Level	**Dependent Variable:**	**Model 1.1**	**Model 1.2**	**Model2.1**	**Model2.2**	**Model3.1**	**Model3.2**
	Research and Innovation Policy Effectiveness	**Formal Coordinative Model (PCA)**	**Formal Coordinative Model (Equal Weights)**	**Informal Coordinative Model (PCA)**	**Informal Coordinative Model (Equal Weights)**	**Communicative Model (PCA)**	**Communicative Model (Equal Weights)**
Distal	**Influence Variables:**						
	Property Rights	**0.0789****	**0.0825*****	**0.0756****	**0.0770****	**0.0713****	**0.0732****
		0.0254	**0.0247**	**0.0262**	**0.0263**	**0.0295**	**0.0287**
	Media Access of Politicians	**0.585***	**0.619***	**0.722****	**0.733****	**0.675****	**0.693****
		0.342	**0.366**	**0.336**	**0.339**	0.315	0.339
	Signed Petitions	**0.0967***	**0.0988***	**0.0896***	**0.0883***	0.0982	0.0993
		0.0531	**0.0529**	**0.0518**	**0.0521**	**0.0612**	**0.0622**
	Attended Demonstrations	**-0.0720****	**-0.0759****	**-0.0739****	**-0.0736****	**-0.0694****	**-0.0719****
		0.0263	**0.0251**	**0.0284**	**0.0282**	**0.0309**	**-.0306**
Proximate	Index_PPG4_Formal Coordination	**0.943****					
		0.347					
	Index_PPG4_ Formal Coordination (ew)		**1.929****				
			0.725				
	Index_PPG4_Informal Coordination			**0.845****			
				0.33			
	Index_PPG4_ Formal Coordination (ew)				**1.699****		
					0.658		
	Index_PPG4_Policy Communication					**0.806****	
						0.268	
	Index_PPG4_ Policy Communication (ew)						**1.720*****
							0.523

cut1	14.59***	15.49***	14.77***	15.00***	13.54***	14.34***
_cons	3.111	3.911	2.944	3.057	2.979	3.184
cut2	20.19***	21.34***	20.34***	20.66***	18.63***	19.78***
_cons	4.152	5.114	3.972	4.113	3.974	4.248
cut3	22.22***	23.46***	22.14***	22.49***	20.30***	21.51***
_cons	4.411	5.461	4.149	4.302	3.992	4.283
cut4	23.41***	24.70***	23.27***	23.62***	21.43***	22.66***
_cons	4.602	5.691	4.301	4.452	4.098	4.387
cut5	27.00***	28.31***	26.31***	26.68***	25.19***	26.45***
_cons	4.666	5.836	4.225	4.371	4.915	5.118
cut6	30.27***	31.52***	29.65***	30.01***	28.60***	29.96***
_cons	5.586	6.769	4.996	5.156	5.738	6.029
Member States	28	28	28	28	28	28
omodel: Approximate likelihood-ratio test of proportionality of odds across response categories:	**chi2(25) = 29.65 Prob > chi2 = 0.2376**	**chi2(25) = 31.93 Prob > chi2 = 0.1600**	**chi2(25) = 27.80 Prob > chi2 = 0.3173**	**chi2(25) = 27.76 Prob > chi2 = 0.3190**	**chi2(25) = 32.95 Prob > chi2 = 0.1324**	**chi2(25) = 26.47 Prob > chi2 =0.3831**

Standard errors below coefficients * p<0.10, ** p<0.05, *** p<0.001, ew: equal weights PCA: Principal Component Analysis

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